Massachusetts Coastal Infrastructure Inventory and Assessment Project
Massachusetts Department of Conservation and Recreation
Office of Waterways

Upper Cape Cod

Bourne
Sandwich
Mashpee

July 6, 2009

Prepared for:
Massachusetts Department of Conservation and Recreation
Hingham, Massachusetts

Presented by:
Bourne Consulting Engineering
Franklin, Massachusetts

In Association With:
Applied Coastal Research & Engineering

Bourne Consulting Engineering
Waterfront Engineers
MASSACHUSETTS COASTAL INFRASTRUCTURE INVENTORY AND ASSESSMENT PROJECT

Upper Cape Cod

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Section I

Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION

PURPOSE

DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES

DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS
Section I – Coastal Hazards Infrastructure and Assessment Program

INTRODUCTION

The Project and Client

The Commonwealth of Massachusetts has initiated a Coastal Hazards Commission (CHC) to identify the vulnerability of the state to coastal hazards. As one of five working groups working under the CHC, the 20-Yr Infrastructure Plan was to establish a prioritization for the repair of coastal structures. The focus areas of the Working Group include:

- Publicly owned infrastructure
- Infrastructure for which State is responsible
- Inventory of public hazards infrastructure
- Evaluation on conditions
- Development for a prioritization of work
- Estimation of capital and maintenance costs

The 20-Yr Infrastructure Working Group is led by Representative Frank Hynes with CZM as the lead State Agency overseeing the management of the project. The Massachusetts coastline has been broken up into 4 major regions consisting of the North Shore, Boston, South Coast, and the Cape and Islands. The South Shore (the Towns of Hull, Cohasset, Seekonk, Hingham, Plymouth, Kingston, Scituate and Duxbury) was previously evaluated by Bourne Consulting Engineering as a demonstration project in 2006.

Consultant Team

The consultant team that performed the demonstration project was led by Bourne Consulting Engineering (BCE) of Franklin, MA who was responsible for overall project management, specified areas of field assessments, and research. Assisting BCE was Applied Coastal Research and Engineering Inc. of Mashpee, MA, Childs Engineering Corporation, of Medfield, MA., and Waterfront Engineer LLC of Stratham, NH.

PURPOSE

Study Purpose

CZM seeks to identify the capacity of Massachusetts coastal structures to resist major coastal storms and prevent storm damage. In working toward this goal, CZM has initiated a program to perform an assessment of Commonwealth owned and/or maintained coastal structures. The first phase of this program was the performance of a demonstration project for coastal structures located on the South Shore. The demonstration project identified existing structures, their general conditions, ability to provide coastal protection and the probable cost for repairs. The information collected and developed has been incorporated into the MassGIS system to allow use for developing a 20 Year Coastal Infrastructure Plan.

The demonstration project served as a basis for the current statewide inventory assessment of all Commonwealth coastal structures and the needs for their maintenance and/or repair.
Goals of Study

The goals of the Massachusetts Coastal Infrastructure Inventory and Assessment Project include:

- To identify all the coastal structures the state either owns or has responsibility to maintain for the 4 regions included within the study.
- Of the structures identified, determine the structure location and characteristics, the structure condition relative to providing coastal protection and the structure importance in relation to what it is protecting.
- To the degree possible, identify the structure elevation and the FIRM mapping flood elevation and category.
- To the degree possible, identify structure owner and available documents from local, state and federal agencies.
- To establish an estimated cost to rehabilitate the coastal structures to provide the level of project established in the structure’s original design.
- Provide the information in a format compatible for incorporation into the MassGIS system.

Limit of Study

Due to the time constraints and the amount of effort necessary to collect, process and compile the information, the following are identified as limitations of the information presented:

- All property ownership was taken as presumed. No legal investigation of ownership was performed during the project. Property ownership is based on town assessor maps. Where structures were located outshore of assessor map defined property lines, it was assumed to be Town land unless other information indicated otherwise. Where structures were located outshore of Mean Low Water, property is assumed to be State owned.

- The structure ownership was based on assessor maps and research at the local, state and federal levels. Where there was indication of public work on a structure on Town land or on private property, the structure was presumed to be Town owned. Where the structure was on state property, the structure was presumed to be state owned. Where ownership of the structure was not clear but was located on private property, the structure ownership was defined as unknown.

- The study included town and state owned structures as it was assumed that most town owned structures received state funding at some level for construction and/or maintenance.
  - Structures that were determined to be private were not included.
  - Undocumented structures considered to be on private land, but having the potential to have been publicly built and/or maintained, were identified as having an “unknown ownership”.

- The prioritizing of structures was based primarily on risk to general infrastructure and density of housing. Infrastructure included was buildings. The study did not consider all infrastructure issues including:
  - No consideration on utility impacts – water, electrical, sewer, gas
  - No consideration of roadway and bridge protection
  - Evacuation routes were not considered within the investigation
  - Location of Emergency Shelters were not included in priority assessments

- Research was performed at the local, state and federal levels. The local research was limited to location and documenting available coastal structure contract drawings. Research at DCR was restricted to available historic construction plans for coastal structures at the MA-DCR Waterways office in Hingham, MA, and MA-DCR Division of Urban Parks and Recreation in
Massachusetts Coastal Infrastructure Inventory and Assessment Demonstration Project

Boston, MA. No investigation of state archives was performed. Research at MA DEP Chapter 91 and USACE was limited to recorded permits and licenses found in their files. No investigation was performed at the Registry of Deeds.

DEVELOPMENT OF MassGIS DATABASE ATTRIBUTES

The specific attributes that would be incorporated into the MassGIS system were developed based on the scope of work and the goals to be achieved. The following was established to standardize the data collection and presentation and to allow total flexibility for sorting by attributes in the final GIS database. The attributes identified below were input into a MS Access database which was used to manage the data from all eight communities within a single file.

Database Attributes
• Attribute Descriptions/Definitions

Structure Number: A unique structure number was given to each coastal structure. The number was based on existing numbering systems that include the State Department of Environmental Protection community number followed by the local community assessor’s parcel numbering system. The last three digits of the number represent the structure within the parcel. Where structures extend over several parcels, the structure is referenced to a parcel that is approximately in the center of the structure. Where Town assessor’s references include letters, those are also included within the structure number. Some communities have block numbering within their numbering system and these are included. Communities without block numbering still have the block numbering included but these are illustrated as all zeros for that specific segment.

Structures that are on Town property, which would otherwise not have a parcel number, are referenced to a parcel that is in the immediate vicinity of the coastal structure.

On this basis, the following is the general numbering convention:

CCC-MMM-BBB-PPP-SSS

Where:
CCC       DEP Community Number
 MMM      Community Map Number
  BBB    Block Number (000 if no block numbering system)
  PPP     Community Parcel Number
   SSS   Structure Number

Property Ownership: All property ownership was on a “presumed” basis as no legal verification of ownership was performed. The ownership of the property was classified under four basic areas which were private ownership (Private), Town ownership (Local), Commonwealth of Massachusetts ownership (State), federal government ownership (Federal) or unknown. Property ownership was based on Town assessor’s maps. Where the location was located above Mean Low Water, and not within a defined parcel, the property ownership was presumed to be the Town unless documentation was found to indicate otherwise. Where a structure was located offshore of Mean Low Water, the property ownership was presumed to be federal.

Structure Ownership: The ownership of all structures is presumed as no verification of ownership was performed. Ownership of the structure was determined by research into historic state and federal
permits and the entity indicated on the permits as the applicant. Where no other information was found, the following was utilized:

- Structures located on private land but appearing to be significant structures were identified as owned by the Town or as “Unknown”. Unknown was used were there was a question of local or private ownership.
- Structures on Town property were assumed to be owned by the Town
- Structures that were located off-shore were presumed to be federally owned
- Structures that were identified as being privately owned were eliminated from the database

**Basis of Ownership:** The basis of structure ownership was provided to give rationale to the structure ownership and identified the research resource that identified the ownership or the methodology otherwise used. The responses utilized were limited to the following:

- DPW - DPW Employee Interview
- DCR - Contract Drawings
- DEP - Ch 91 License
- USACE - Permits
- Property Ownership
- Offshore Structure

**Structure Owner’s Name:** Ownerships names reflect the presumed owner of publicly owned structures. As this was for public structures only, the ownership was restricted to the community name, the state agency or the federal agency.

**Earliest Structure Record:** The year of the oldest document located for the structure. The information is determined from the document research performed on the structure from local, state and federal agencies. If no documents could be found than this entry is denoted as “Unknown”. Where documentation of the structure could be found, the date from the oldest document was utilized.

**Primary Structure / Secondary Structure:** Many of the coastal structures consisted of combined structures which were rated separately. It was typically found that one structure was significantly more predominant (Ex. Bulkhead/Seawall) and was therefore identified as the Primary Structure while a smaller structure might exist in front (ex. Revetment) of it. The type, height and material of each structure are identified separately. The condition of each structure was based on the Primary Structure. Where there was no secondary structure, the fields were left blank.

**Structure Type:** The structure type was categorized into five basic coastal structure categories which were Bulkhead/Seawall, Revetment, Coastal Beach, Coastal Dune, and Jetty/Groin.

**Structure Material:** The identification of the coastal structure’s material of construction was performed and represents the primary material. Stone structures consisted of both mortared and non-mortared conditions.

**Structure Height:** Each type of structure was categorized by its visible height in feet which was broken into four specific ranges which are:

- < 5 feet
- 5 to 10 feet
- 10 to 15 feet
- >15 feet

**Structure Condition:** A preliminary assessment of the condition for each structure was performed by the field teams. This was by visual observation only and no detailed investigation was performed. The condition assessments were based on a predefined five level rating system that ranged from Rating A for Excellent Condition to Rating F for Critical Condition. A detailed listing of the conditions and their definitions can be seen in Exhibit A.
Priority Rating: In order to account for the need for protection at any one site, a five level priority rating system was established. This allowed for consideration of public infrastructure protection, density of residential housing for development of structure overall importance for coastal protection. The ratings range from Level 1 for no infrastructure or residence protection to Level 5 for critical inshore infrastructure protection and/or high density residential. The detailed listing and definitions for the priority categories can be seen in Exhibit B.

Structure Repair / Reconstruction Cost: A preliminary estimation of construction costs to maintain or repair structures was made based on the preliminary field assessment of the structures. A Repair Cost Matrix was developed based on structure type, condition, height and material and can be seen in Exhibit C. Once each structure’s type, height, and material classifications were determined, the cost per foot for the structure was determine from the Repair Cost Matrix and multiplied by the length of the structure to obtain the estimated repair/restoration cost. The cost matrix repair costs include a 20 percent construction cost contingency as well as 10 percent costs for engineering and permitting.

Structure Length: The length of each structure is provided and utilized in the development of the repair/reconstruction costs. The lengths are given to the nearest foot and taken as the linear distance along the structure, as determined by the GPS location, which takes into account structure angles and curvature.

Structure Elevation: The elevation of structures was determined in feet from existing information where available. The datum used is NAVD 88 and elevations are to the nearest foot. From a previous study much of the south shore coastal structures had elevations defined based on LIDAR mapping data. Where available structure documentation with elevations was found, in areas with no LIDAR data, the information was included within the structure information. Where there was no LIDAR information or existing documentation, the item has been left blank.

LIDAR (Light Detection and Ranging) is technology that is currently being used for high-resolution topographic mapping by mounting a LIDAR sensor, integrated with Global Positioning System (GPS) and inertial measurement unit (IMU) technology, to the bottom of aircraft and measuring the pulse return rate to determine surface elevations.

FEMA Zone and Elevation: For each structure the FEMA Flood Insurance Rate Maps (FIRM) were researched for their Flood Zone designation and their Base Flood Elevation from the most recent FIRM maps for the specific Town. The elevations are provided in feet on the same datum as the FIRM maps (NGVD) with no adjustments or conversions.

Structure Comments: The engineering team provided a brief description and comment on the structure at the time of the field assessments which is provided in support of the condition rating that was given for the structure.

Pictures: At the time of the field assessments, digital photographs were taken to provide a general overview of the structure. The number of pictures was limited to a maximum of six. The first photograph for each structure is shown on the Structure Assessment Form. The list of all photographs is provided on the form.

Town Documents: Town documents represent the structure information that could be found in the Town’s DPW/Engineering Department records. Where particular records could be found, a table of document information was developed and included within the database with limited descriptions.
MA - DCR Documents: MA-DCR documents represent the structure information that could be found within DCR – Waterways office in Hingham. Where particular records could be found, a table of document information was developed and included within the database with limited descriptions.

MA - DEP Chp. 91 Licenses: MA-DEP Chapter 91 license documents represent the structure information that could be found within MA-DEP Chp 91 records in Boston. Where particular records could be found, they were scanned as pdf files and attached to the structure through the GIS database information. In addition, a table of license document information was developed and included within the database with limited descriptions.

USACE Permits: USACE Permits represent the structure information that could be found within the Army Corp of Engineers regulatory office in Concord, MA. Where particular records could be found, they were scanned as pdf files and attached to the structure through the GIS database information. In addition, a table of license document information was developed and included within the database with limited descriptions.

DEVELOPMENT OF REPAIR / RECONSTRUCTION COSTS

A matrix to be used within the database has been developed to assess likely rehabilitation/repair costs to restore the coastal structures to their original design condition. No attempt was made to assess the level of exposure and associated level of protection that might be required to meet current design standards for these structures. These costs are only an estimation to bring these structures back to their original design intent based on 2006 construction costs.

The development of the cost matrix is based on the following:

Structure Condition Ratings. – The condition of the coastal structures was determined in the field by the survey crew which was led by an engineer with waterfront structure assessment and design experience. The definitions of the rating criteria utilized for the assessments are presented elsewhere.

The cost implications for each rating condition are as follows:

- **A Rating**  Structures not requiring any maintenance, repair or rehabilitation cost and would not be expected to experience damage if subject to a major coastal storm event

- **B Rating**  Structures requiring limited or no repair and would be expected to experience only minor damage if subject to a major coastal storm event. The value of these maintenance costs is assumed to be 10 percent of the construction cost.

- **C Rating**  Structures requiring moderate to significant level of repair or reconstruction and would be expected to experience significant damage if subject to a major coastal storm event. The structure is presumed to be effective under a major storm event. The value of the repair costs is assumed to be 50 percent of the construction cost.

- **D Rating**  Structures requiring significant level of rehabilitation or total reconstruction and would be expected to experience significant damage or possibly fail if subject to a major coastal storm event. The value of the repair costs is assumed to be 100 percent of the construction cost.
- **F Rating** Structures requiring complete reconstruction and would expect to provide little or no protection from a major coastal storm event. The value of the repair costs is assumed to be 100 percent of the construction cost plus a cost for removal/disposal of the original structure.

**Height of Structure** – Height of a structure is a major factor in the structure cost and therefore was identified as a significant factor in assessing rehabilitation/repair construction costs. The structures were broken down into four major categories which were:

- < 5' Structures that were less than five feet in height
- 5'-10' Structures five to 10 feet in height
- 10'-15' Structures over 10 feet to 15 feet in height
- > 15' Structures greater than 15 feet in height – assumed 20 feet typical

**Length of Structure** – Length is based on field GPS location with measurements rounded to the nearest foot.

**Bulkhead / Seawall Structures** – These structures are assumed to be constructed out of concrete, steel, stone or wood with each having its own criteria for establishing costs. For each structure type the following was assumed:

- Concrete Seawalls – These walls were assumed to be gravity structures with the volume of concrete used based on the bottom width being one-half of the structure height. Costs of construction were based on a per cubic yard estimate that varied from $350 to $630 per cubic yard depending on the structure height. Values for excavation and demolition of existing structure were also included.

- Stone Seawalls - These walls were treated the same as concrete seawalls and assumed to be gravity structures with the volume of the structure based on the bottom width being one-half of the structure height. Costs of construction were based on a per cubic yard estimate that varied from $350 to $630 per cubic yard depending on the structure height. Values for excavation and demolition of existing structure were also included.

- Steel Bulkheads – Steel bulkheads were presumed to be constructed with steel sheet piling. Tie back systems were presumed for structures 10 feet or greater in height. Shorter walls were assumed to have a cantilever design. The total depth of sheeting was presumed to be two times the exposed height. The cost for construction varied from $40 per square foot to $60 per square foot plus the cost of excavation and demolition.

- Timber Bulkheads – Timber bulkheads were presumed to be constructed with timber piles at eight foot on center, horizontal wales and vertical four inch sheathing. The unit costs for installed materials used were $1,500 per pile and $7.50 per bfm.

**Revetment Structures** – Revetment structures were presumed to be constructed of dry placed (no concrete) stone with a two on one slope and a horizontal toe and crown equal to the thickness layer established for each height condition. The total thickness of the revetment layers varied from six to ten feet with the cost of armor and under-layer stone assumed to be $50 per ton and the crushed stone base to be $15 per ton.
Groins and Jetties – Groins and jetties were assumed to be the same materials and construction as the revetment structures but would have two sides and therefore double the quantities.

Coastal Beaches – Costs for restoration of Coastal beaches presumed the placement of beach renourishment sands at a 1-on-20 slope over the existing beach conditions. The cost for deposition of sand assumed relatively close source of material and utilized $20 per cubic yard for the material installed.

Coastal Dunes – Restoration of coastal dunes assumed a cross section of renourished sand with a one-on-four slope on one side of a 25 foot width at the defined dune height. The cost for deposition of sand assumed relatively close source of material and utilized $20 per cubic yard for the material installed.

Contingency – A contingency of 20 percent was added to all costs to reflect the unknowns associated with this level of rehabilitation/repair estimating.

Engineering and Regulatory Approvals – A ten percent increase to the cost matrix prices was assessed to represent the engineering design and regulatory approval requirements for the restoration of these structures.
EXHIBIT A

Structure Condition Table – 5 Level Rating System

<table>
<thead>
<tr>
<th>Preliminary Condition Assessment</th>
<th>Definition Based Upon Perceived Immediacy of Action and Potential to Cause Damage if Not Corrected</th>
<th>Level of Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Excellent</td>
<td>Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm</td>
<td>None</td>
</tr>
<tr>
<td>B  Good</td>
<td>Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure</td>
<td>Minor</td>
</tr>
<tr>
<td>C  Fair</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life</td>
<td>Moderate</td>
</tr>
<tr>
<td>D  Poor</td>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Major</td>
</tr>
<tr>
<td>F  Critical</td>
<td>Conditions of structure/landform may warrant emergency stabilization as failure may result in potential loss of property and/or life. Landform eroded, loss of integrity Structure exhibits critical levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure provides little or no protection from a major coastal storm. Actions taken to totally reconstruct structure to regain full capacity. Landform stability is severely compromised, rate of erosion/material loss may be increasing, and landform does not provide adequate protection from a major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
## EXHIBIT B

**Priority Rating System** - 5 Level Rating System

<table>
<thead>
<tr>
<th>Preliminary Priority Level Assessment</th>
<th>Level Based Upon Perceived Immediacy of Action and Presence of Potential Risk to Inshore Structures if Not Corrected</th>
<th>Level of Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  None</td>
<td>No Inshore Structures or Residential Dwelling Units Present</td>
<td>Long Term Planning Considerations</td>
</tr>
<tr>
<td>II Low Priority</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
<td>Future Project Consideration</td>
</tr>
<tr>
<td>III Moderate Priority</td>
<td>Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (&lt;1 dwelling impacted / 100 feet of shoreline)</td>
<td>Consider for Active Project Improvement Listing</td>
</tr>
<tr>
<td>IV High Priority</td>
<td>High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)</td>
<td>Consider for Next Project Construction Listing</td>
</tr>
<tr>
<td>V Immediate / Highest Priority</td>
<td>Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Conditions of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (&gt;10 dwellings impacted / 100 feet of shoreline)</td>
<td>Consider For Immediate Action Due to Public Safety and Welfare Issues</td>
</tr>
</tbody>
</table>
### REPAIR / REHABILITATION COSTING DATA

Cost per linear foot of structure

<table>
<thead>
<tr>
<th>STRUCTURE TYPE</th>
<th>STRUCTURE MATERIALS</th>
<th>Structure Height</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>BULKHEAD/ SEAWALL</td>
<td>CONCRETE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$64</td>
<td>$425</td>
<td>$850</td>
<td>$983</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$152</td>
<td>$759</td>
<td>$1,518</td>
<td>$1,782</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,970</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,980</td>
<td>$3,060</td>
<td>$4,752</td>
</tr>
<tr>
<td></td>
<td>STEEL</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$54</td>
<td>$273</td>
<td>$546</td>
<td>$660</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$165</td>
<td>$825</td>
<td>$1,650</td>
<td>$1,848</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$251</td>
<td>$1,254</td>
<td>$2,508</td>
<td>$2,772</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$343</td>
<td>$1,716</td>
<td>$3,452</td>
<td>$3,795</td>
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<tr>
<td></td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$64</td>
<td>$425</td>
<td>$850</td>
<td>$983</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$152</td>
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<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,980</td>
<td>$3,960</td>
<td>$4,752</td>
</tr>
<tr>
<td></td>
<td>WOOD</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$66</td>
<td>$431</td>
<td>$862</td>
<td>$994</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$127</td>
<td>$632</td>
<td>$1,265</td>
<td>$1,453</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$161</td>
<td>$804</td>
<td>$1,608</td>
<td>$1,872</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$202</td>
<td>$1,008</td>
<td>$2,017</td>
<td>$2,380</td>
</tr>
<tr>
<td>COASTAL BEACH</td>
<td>SAND</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$26</td>
<td>$132</td>
<td>$264</td>
<td>$264</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$127</td>
<td>$634</td>
<td>$1,267</td>
<td>$1,267</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$224</td>
<td>$1,122</td>
<td>$2,244</td>
<td>$2,244</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$396</td>
<td>$1,980</td>
<td>$3,960</td>
<td>$3,960</td>
</tr>
<tr>
<td>COASTAL DUNE</td>
<td>SAND</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$18</td>
<td>$93</td>
<td>$166</td>
<td>$166</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$48</td>
<td>$236</td>
<td>$476</td>
<td>$476</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$79</td>
<td>$395</td>
<td>$790</td>
<td>$790</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$132</td>
<td>$880</td>
<td>$1,320</td>
<td>$1,320</td>
</tr>
<tr>
<td>REVETMENT</td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$56</td>
<td>$333</td>
<td>$664</td>
<td>$730</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$120</td>
<td>$601</td>
<td>$1,201</td>
<td>$1,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$157</td>
<td>$781</td>
<td>$1,584</td>
<td>$1,696</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$247</td>
<td>$1,234</td>
<td>$2,468</td>
<td>$2,996</td>
</tr>
<tr>
<td>GROIN</td>
<td>STONE</td>
<td>Under 5 Feet</td>
<td>$0</td>
<td>$132</td>
<td>$664</td>
<td>$1,328</td>
<td>$1,460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 To 10 Feet</td>
<td>$0</td>
<td>$240</td>
<td>$1,201</td>
<td>$2,402</td>
<td>$2,600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 To 15 Feet</td>
<td>$0</td>
<td>$314</td>
<td>$1,584</td>
<td>$3,128</td>
<td>$3,392</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 15 Feet</td>
<td>$0</td>
<td>$454</td>
<td>$2,468</td>
<td>$4,937</td>
<td>$5,333</td>
</tr>
</tbody>
</table>

**NOTE:** Repair / Rehabilitation Costs include 10% for engineering and regulatory approvals and 20% construction contingency.
Section II

Bourne
Section II – Community Findings – Town of Bourne

COMMUNITY DESCRIPTION

The Town of Bourne consists of a land area of 40.9 square miles out of a total area of 52.82 square miles and had a population of 18,721 in the 2000 census. The Town is located on Cape Cod of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline is 28 miles. Of the 28 miles, 2 miles are exposed to open ocean, while the remaining 26 are for the most part protected by Falmouth and Gosnold. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Bourne, there were 34 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 12 in Section II-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Primary Structure</th>
<th>Total Structures</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td>2200</td>
</tr>
<tr>
<td>Revetment</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td>2893</td>
</tr>
<tr>
<td>Breakwater</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>2525</td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>2525</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>2525</td>
</tr>
<tr>
<td>Coastal Beach</td>
<td>9</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
<td>7330</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
<td><strong>3</strong></td>
<td><strong>19</strong></td>
<td><strong>8</strong></td>
<td><strong>4</strong></td>
<td></td>
<td><strong>14948</strong></td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Bourne’s case there are a total of 31 structures which would require approximately $4.8 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $217,000 million would be required to upgrade the Town’s coastal protection.
Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Bourne, the breakdown of structures by assumed ownership is as follows:

**STRUCTURE OWNERSHIP / REPAIR COST - Town of Bourne**

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Owned</td>
<td>27</td>
<td>$1,134,971 $3,065,113 $216,724</td>
<td>$4,416,808</td>
</tr>
<tr>
<td>Commonwealth of Massachusetts</td>
<td>4</td>
<td>$457,211</td>
<td>$457,211</td>
</tr>
<tr>
<td>Federal Government Owned</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td>3</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section II-B which contains Structure Assessment Reports for each individual structure found.

**SUMMARY**

The enclosed reports and associated documents reflects the Town of Bourne’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section II - Bourne

Part B

Structure Assessment Reports
**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Homestead Avenue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>10/24/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bourne</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>$24,684.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Feet</td>
<td>Feet NAVD 88</td>
<td></td>
<td>13 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revetment</td>
<td>Stone</td>
<td>Over 15 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Structure Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The riprap is dumped below the stair access to the beach. The stones are 6 inches in diameter and mixed with debris from the previous stairs. The stones are at a 1 on 10 slope.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure Images:</th>
</tr>
</thead>
<tbody>
<tr>
<td>007-016-000-001-100-PHO1A.JPG</td>
</tr>
</tbody>
</table>

| Structure Documents: |

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

**Property Owner:**
Local

**Presumed Structure Owner:**
Local

**Owner Name:**
Bourne

**Location:**
Sagamore Road

**Date:**
10/24/2007

**Based On Comment:**

**Earliest Structure Record:**
Unknown

**Estimated Reconstruction/Repair Cost:**
$12,012.00

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Feet</td>
<td>18 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>VE</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revetment</td>
<td>Stone</td>
<td>5 to 10 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
</tr>
</thead>
</table>

**Structure Summary:**
15 feet of stones at a 1 on 3 slope are securing a dune adjacent to beach stair access. The stones are on average 3 feet by 1 foot by 2 feet. There is a house and parking lot behind the structure.

**Condition Rating**

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.</td>
</tr>
</tbody>
</table>

**Priority Rating**

<table>
<thead>
<tr>
<th>Priority Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate Priority</td>
<td>Consider for Active Project Improvement Listing</td>
</tr>
</tbody>
</table>

**Structure Images:**
007-025-000-147-100-PH01A.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Clark Road
Based On Comment: Earliest Structure Record: 1947

Date: 10/24/2007
Estimated Reconstruction/Repair Cost: $120,120.00

Length: 100 Feet NAVD 88
Top Elevation: Feet NGVD 13
FIRM Map Zone: VE
FIRM Map Elevation: 

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
Scattered stones make up a partially buried revetment. The stones are there to secure the slope from the parking lot above to the beach. The stones are on average 1 foot by 2 feet in size and at a 1 on 5 slope. There is a boat ramp adjacent and a road behind the parking lot being secured.

Condition Rating Description
D Poor Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
007-026-000-004-100-PHO1A.JPG

Structure Documents:
| USACE | August 1952 | Proposed Groin | 007-026-000-004-100-COE1A |
| USACE | November 1 | Proposed Groin | 007-026-000-004-100-COE1B |
| MA-DCR | December 1 | Proposed Jetty and | 007-026-000-004-100-DCR1A |
| MA-DCR | April 1957 | Proposed Shore | 007-026-000-004-100-DCR1B |

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Cape Cod Bay
Based On Comment: Unknown
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $346,800.00

Date: 10/24/2007

Length: 1445 Feet
Top Elevation: 9 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 15 Feet NGVD

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
The 10 groins are made up of stones that average 3 feet by 2 feet by 2 feet in size. The crest of the groin is one stone width. Concrete mortar is holding the stones in place. The groins extend out to mean low water.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
I None
Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images:
- 007-030-000-050-100-PHO1A.JPG
- 007-030-000-050-100-PHO1B.JPG
- 007-030-000-050-100-PHO1C.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Lewis Point Road</td>
<td>10/24/2007</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bourne</td>
<td>2001</td>
<td>$586,080.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>925 Feet</td>
<td>Feet NAVD 88</td>
<td>VE</td>
<td>23 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal Beach</td>
<td>Sand</td>
<td>5 to 10 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Town renounced the private beach in order to gain public access. The beach is not well graded, on average at a 1 to 25 slope. It is made up of coarse sand and gravel. The beach is separated by private groins. There is section loss throughout.</td>
</tr>
</tbody>
</table>

**Condition Rating**
- C
- Fair

**Level of Action Description**
- Moderate

**Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.**

**Priority Rating**
- II
- Low Priority

**Future Project Consideration**
- Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**
- 007-072-000-017-100-PHO01A.jpg
- 007-072-000-017-100-PHO01B.jpg
- 007-072-000-017-100-PHO01C.jpg

**Structure Documents:**
- DEP | June 28, 200 | Proposed New and | 007-072-000-017-100-LIC1A

Prepared By: Bourne Consulting Engineering
## CZM Coastal Infrastructure Inventory and Assessment
### Structure Assessment Form

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Gardenier Avenue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Earliest Structure Record:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bourne</td>
<td>Unknown</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length: 215 Feet</th>
<th>Top Elevation: 15 Feet NAVD 88</th>
<th>FIRM Map Zone: AE</th>
<th>FIRM Map Elevation: 15 Feet NGVD</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Primary Type: Coastal Beach</th>
<th>Primary Material: Sand</th>
<th>Primary Height: 5 to 10 Feet</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

### Structure Summary:
The sand beach is well graded at a 1 on 30 slope. Inshore of the beach is a concrete seawall and small park.

### Condition Rating Level of Action Description
- A
- Excellent
- None
- Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm.

### Priority Rating Action Description
- II
- Low Priority
- Future Project Consideration
- Inshore Structures Present with Limited potential for Significant Infrastructure Damage

### Structure Images:
- [007-087-000-075-100-PHO1A.jpg](007-087-000-075-100-PHO1A.jpg)
- [007-087-000-075-100-PHO1B.jpg](007-087-000-075-100-PHO1B.jpg)

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Gardenier Avenue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
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<tbody>
<tr>
<td>Local</td>
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<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Estimated Reconstruction/Repair Cost:</th>
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<tbody>
<tr>
<td>Bourne</td>
<td>$9,715.00</td>
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<table>
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<tr>
<th>Length:</th>
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<tbody>
<tr>
<td>115 Feet</td>
<td>Feet NAVD 88</td>
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<table>
<thead>
<tr>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
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</thead>
<tbody>
<tr>
<td>AE</td>
<td>15 Feet NGVD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
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<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Concrete</td>
<td>Under 5 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

**Structure Summary:**
Precast concrete seawall is made up of 2 feet by 1 foot by 3 feet blocks stacked on top of each other. The visible height of the structure is only 2.5 feet. The concrete is slightly deteriorating throughout. There is a park behind the wall and a beach in front.

**Condition Rating**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Good</td>
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</table>

**Priority Rating**

<table>
<thead>
<tr>
<th>Priority</th>
<th>Rating</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Low Priority</td>
<td>Future Project Consideration</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
</tbody>
</table>

**Structure Images:**
007-087-000-075-200-PHO2A.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Harbor Place
Based On Comment:

Earliest Structure Record: 1980
Estimated Reconstruction/Repair Cost: $1,592,118.00

Date: 10/24/2007

Length: 1290 Feet
Top Elevation: 17 Feet NGVD
FIRM Map Zone: VE
FIRM Map Elevation:

Primary Type: Revetment
Primary Material: Stone
Primary Height: Over 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
The revetment is made up of stones that are approximately 2 feet by 1 foot in size. The slope of the revetment is 1 on 2. There is major section loss, especially at the corner of the harbor and Buzzards Bay. There is exposed understone and filter fabric lining. Above is a marina. Adjacent is a boat ramp and railroad.

Condition Rating Level of Action Description
C Fair Moderate Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
IV High Priority Consider for Next Project Construction Listing
High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)

Structure Images:
007-117-000-042-100-PHO1A.JPG
007-117-000-042-100-PHO1B.JPG

Structure Documents:
USAGE July 1980 Proposed Bourne 007-117-000-042-100-COE1A

Prepared By: Bourne Consulting Engineering
**Property Owner:**
State

**Presumed Structure Owner:**
State

**Owner Name:**
Mass Highway Department

**Location:**
Main Street Bridge

**Based On Comment:**

**Earliest Structure Record:**
Unknown

**Date:**
10/24/2007

**Estimated Reconstruction/Repair Cost:**
$25,225.00

---

**Length:**
210 Feet NAVD 88

**Top Elevation:**

**FIRM Map Zone:**
AE

**FIRM Map Elevation:**
15 Feet NGVD

**Primary Type:**
Revetment

**Primary Material:**
Stone

**Primary Height:**
5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

---

**Structure Summary:**
The bridge abutment is surrounded by placed stones. The stones are on average 1 foot by 1 foot. There is slight stone movement visible. Unraveling is visible at the toe.

**Condition Rating**
B Good

**Level of Action Description**
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority Rating**
II Low Priority

**Future Project Consideration**
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

---

**Structure Images:**
007-117-000-155-100-PHO1A.jpg

**Structure Documents:**

---

**Prepared By:** Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Tower Lane

Date: 10/24/2007

Based On Comment: 

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $172,260.00

Length: 1305 Feet
Top Elevation: 18 Feet NGVD
FIRM Map Zone: VE
FIRM Map Elevation: 18 Feet NGVD

Primary Type: Coastal Beach
Primary Material: Sand
Primary Height: Under 5 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
The beach, mainly made up of marsh, is in poor condition in most areas. It is at a 1 on 100 slope. Where the beach meets Massachusetts Maritime Academy, there is a fine sand that is more evenly graded.

Condition Rating: C
Level of Action: Moderate
Description: Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

Priority Rating: None
Action Description: Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
007-120-000-099-100-PHO1A.JPG
007-120-000-099-100-PHO1B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: State
Presumed Structure Owner: State
Owner Name: Massachusetts Maritime Academy

Location: Academy Drive
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $16,179.00

Date: 10/24/2007

Length: 103 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 17 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
The dumped stone revetment is made up of stones that average 1 foot by 1 foot by 6 inches. The stones are at a 1 on 5 slope. There is no visible stone movement. The beach in front is visible at low tide. There is a parking lot and school directly behind the structure.

Condition Rating
B Good

Level of Action Description
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating
High Priority
Consider for Next Project Construction Listing
High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)

Structure Images: [007-121-000-051-100-PH01A.JPG]
Structure Documents:

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
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<tbody>
<tr>
<td>State</td>
<td>Academy Drive</td>
</tr>
<tr>
<td>Presumed Structure Owner:</td>
<td>Based On Comment:</td>
</tr>
<tr>
<td>State</td>
<td>Estimated Reconstruction/Repair Cost:</td>
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<tr>
<td>Owner Name:</td>
<td>$124,879.00</td>
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<td>Massachusetts Maritime Academy</td>
<td>1954</td>
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<tr>
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<td>Feet NAVD 88</td>
<td>VE</td>
<td>17 Feet NGVD</td>
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<table>
<thead>
<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
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</thead>
<tbody>
<tr>
<td>Revetment</td>
<td>Stone</td>
<td>10 to 15 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

**Structure Summary:**
The dumped stone revetment is at a 1 on 5 slope. The stone are on average 2 feet by 1 foot in size. The toe is visible at low tide and is coming unravelled. Behind the structure is a parking lot and school buildings.

**Condition Rating**
- **Description:** Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.
- **Rating:** Good

**Priority Rating**
- **Description:** High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)
- **Action Rating:** High Priority
- **Action Description:** Consider for Next Project Construction Listing

**Structure Images:**
- [007-121-000-051-200-PHO2A.JPG](#)

**Structure Documents:**
- [USACE](#) | June 1954 | Proposed Fill and |

**Structure ID:** 007-121-000-051-200

**Town:** Bourne

**Key:** community-map-block-parcel-structure

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Bourne
Structure ID: 007-121-000-051-300
Key: community-map-block-parcel-structure

Property Owner:
State

Presumed Structure Owner:
State

Owner Name: Massachusetts Maritime Academy

Location:
Academy Drive

Based On Comment:

Date:
10/24/2007

Earliest Structure Record:
1958

Estimated Reconstruction/Repair Cost:
$290,928.00

Length: 1160 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 17 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
The concrete seawall surrounds that Massachusetts Maritime Academy. There is a building above the seawall. Large vessels dock along the seawall. There is no visible spalling.

Condition Rating
B Good

Level of Action Description
Minor
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / land form adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
IV High Priority
Consider for Next Project Construction Listing
High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)

Structure Images:
007-121-000-051-300-PHO3A.JPG

Structure Documents:

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<tr>
<th>DEP</th>
<th>Date</th>
<th>Plan Accompanying ID</th>
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<td></td>
<td>May 1995</td>
<td>007-121-000-051-300-LIC3A</td>
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<tr>
<td></td>
<td>October 1,</td>
<td>007-121-000-051-300-LIC3B</td>
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<td></td>
<td>June 1, 201</td>
<td>007-121-000-051-300-LIC3C</td>
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<tr>
<td></td>
<td>January 27,</td>
<td>007-121-000-051-300-LIC3D</td>
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</table>

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Bourne

Location:
Glider Road

Based On Comment:

Earliest Structure Record:
Unknown

Estimated Reconstruction/Repair Cost:
$430,848.00

Length: 680 Feet
Top Elevation: 15 Feet NGVD
FIRM Map Zone: AE
FIRM Map Elevation: 15

Primary Type: Coastal Beach
Primary Material: Sand
Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
The coarse sand beach is not well graded. The slope drops from 1 on 50 to 1 on 10 at the high tide line. There are houses directly behind the beach.

Condition: C
Rating: Fair
Level of Action: Moderate
Description: Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority: IV
Rating: High Priority
Action: Consider for Next Project Construction Listing
Description: High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Density Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)

Structure Images: 007-139-000-185-100-PHO1A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
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<th>Property Owner:</th>
<th>Location:</th>
<th>Date:</th>
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<tr>
<td>Local</td>
<td>Monument Beach - Shore Road</td>
<td>10/24/2007</td>
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<tr>
<td>Presumed Structure Owner:</td>
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<tr>
<td>Owner Name:</td>
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<td>Bourne</td>
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<td>$233,376.00</td>
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<tbody>
<tr>
<td>1040</td>
<td>Feet</td>
<td>VE</td>
<td>18</td>
</tr>
<tr>
<td>Feet NAVD 88</td>
<td>Feet NGVD</td>
<td></td>
<td></td>
</tr>
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</table>

**Structure Summary:**
The coarse sand beach is evenly graded. There is a parking lot and railroad behind it. In the middle of the beach is a pier built over a jetty with a marina outshore.

**Condition Rating**

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action Evaluation</th>
<th>Priority Action Description</th>
</tr>
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<tbody>
<tr>
<td>Good</td>
<td>Low Priority</td>
<td>Minor</td>
<td>Inshore Structures Present with Limited potential for Significant Infrastructure Damage</td>
</tr>
<tr>
<td>Minor</td>
<td>Future Project Consideration</td>
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**Structure Images:**

- 007-160-000-009-100-PHO1A.JPG
- 007-160-000-009-100-PHO1B.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Bourne

Location:
Monument Beach - Shore Road

Date:
10/24/2007

Based On Comment:

Earliest Structure Record:
1948

Estimated Reconstruction/Repair Cost:
$24,000.00

Length: 100 Feet

Top Elevation: Feet NAVD 88

FIRM Map Zone: VE

FIRM Map Elevation: 18 Feet NGVD

Primary Type: Groin/ Jetty

Primary Material: Stone

Primary Height: 5 to 10 Feet

Secondary Type:

Secondary Material:

Secondary Height:

Structure Summary:
The stone groin is made up of stones that are approximately 3 feet by 2 feet by 1 foot in size. There is no visible stone movement or scour. A timber pier is built on top of the jetty and has floats attached outshore of the jetty.

Condition:

Rating:

Level of Action:
Minor

Description:
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority:
Low Priority

Rating:

Action:
Future Project Consideration

Description:
Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
007-160-000-009-200-PHO2A.JPG

Structure Documents:

<table>
<thead>
<tr>
<th>Source</th>
<th>Date</th>
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<tbody>
<tr>
<td>USACE</td>
<td>October 194</td>
<td>Proposed Wharf and Beach</td>
<td>007-160-000-009-200-COE2A</td>
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<td>MA-DCR</td>
<td>April 1955</td>
<td>Proposed Beach</td>
<td>007-160-000-009-200-DCR2A</td>
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<td>DEP</td>
<td>September 1</td>
<td>Proposed Wharf and Beach</td>
<td>007-160-000-009-200-LIC2A</td>
</tr>
</tbody>
</table>

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Bourne

Location:
Arthur Avenue

Based On Comment:

Earliest Structure Record:
Unknown

Estimated Reconstruction/Repair Cost:
$4,356.00

Length:
165 Feet

Top Elevation:
18 Feet NAVD 88

FIRM Map Zone:
VE

FIRM Map Elevation:

Primary Type:
Coastal Beach

Primary Material:
Sand

Primary Height:
Under 5 Feet

Secondary Type:
Secondary Material:

Secondary Height:

Structure Summary:
The beach is made up of sand and gravel. It is well graded. There is a seawall, small park and tennis courts inshore of the beach.

Condition
B

Rating
Good

Priority
None

Level of Action
Minor

Rating
Long Term Planning Considerations

Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Action
No Inshore Structures or Residential Dwelling Units Present

Description

Structure Images:
007-160-000-029-100-PHO1A.jpg

Structure Documents:

Prepare By: Bourne Consulting Engineering
**CZM Coastal Infrastructure Inventory and Assessment**

**Structure Assessment Form**

<table>
<thead>
<tr>
<th>Property Owner:</th>
<th>Location:</th>
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<tbody>
<tr>
<td>Local</td>
<td>Arthur Avenue</td>
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<table>
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<th>Presumed Structure Owner:</th>
<th>Based On Comment:</th>
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<td>Unknown</td>
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<table>
<thead>
<tr>
<th>Owner Name:</th>
<th>Date:</th>
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<tbody>
<tr>
<td>Bourne</td>
<td>10/24/2007</td>
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<table>
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<tr>
<td>VE</td>
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<tr>
<th>Primary Type:</th>
<th>Primary Material:</th>
<th>Primary Height:</th>
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<tbody>
<tr>
<td>Bulkhead/Seawall</td>
<td>Concrete</td>
<td>Under 5 Feet</td>
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</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
</tr>
</thead>
</table>

**Structure Summary:**
The precast concrete blocks are 3 feet by 1 foot by 1 foot stacked on top of each other. The wall appears to be newly constructed. There is a small park above it, tennis court behind it, and a beach outshore.

**Condition Rating**: Excellent

**Level of Action**: None

**Description**: Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm.

**Priority Rating**: None

**Action Description**: Long Term Planning Considerations

No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**
007-160-000-029-200-PH02A.JPG

**Structure Documents:**

**Prepared By**: Bourne Consulting Engineering
# CZM Coastal Infrastructure Inventory and Assessment

## Structure Assessment Form

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Bourne

**Location:**
- Pocasset Inlet

**Date:**
- 10/24/2007

**Earliest Structure Record:**
- Unknown

**Estimated Reconstruction/Repair Cost:**
- $110,400.00

<table>
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<tr>
<th>Length:</th>
<th>Top Elevation:</th>
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<tbody>
<tr>
<td>460 Feet</td>
<td>Feet NAVD 88</td>
</tr>
<tr>
<td>Feet</td>
<td>Feet NAVD 88</td>
</tr>
</tbody>
</table>

**FIRM Map Zone:**
- VE

**FIRM Map Elevation:**
- 18 Feet NGVD

**Primary Type:**
- Groin/Jetty

**Primary Material:**
- Stone

**Primary Height:**
- 5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
The stone groin is located at the southside of the inlet to the Pocasset River. The stones vary in size, but are on average 2 feet by 1 foot by 1 foot in size. The crest is 5 feet wide. There is minor undermining at the toe.

**Condition Rating**
- B (Good)

**Level of Action**
- Minor

**Description**
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

**Priority Rating**
- None

**Long Term Planning Considerations**
- No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**
- 007-194-000-056-100-PHO1A.JPG
- 007-194-000-056-100-PHO1B.JPG

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne
Location: Pocasset Inlet

Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $48,000.00

Date: 10/24/2007

Length: 200 Feet
Top Elevation: 18 Feet NGVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 18 Feet NGVD

Primary Type: Groin/Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
The stone groin is located at the north side of the inlet to the Pocasset River. It is made up of stones that average 2 feet by 1 foot by 1 foot in size. There is undermining at the toe. The crest is 5 feet wide.

Condition Rating Level of Action Description
B Good Minor Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

Priority Rating Action Description
1 None Long Term Planning Considerations No Inshore Structures or Residential Dwelling Units Present

Structure Images:
007-194-000-056-200-PHO2A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Town: Bourne
Structure ID: 007-198-000-116-100
Key: community-map-block-parcel-structure

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Tide Way
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $7,603.00

Date: 10/24/2007

Length: 60 Feet
Top Elevation: 16 Feet NAVD 88
FIRM Map Zone: AE
FIRM Map Elevation: Feet NGVD

Primary Type: Bulkhead/ Seawall
Primary Material: Wood
Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
The timber bulkhead is supported by timber piles. There is minor erosion at the top and buckling. There is no visible scour. There is a gangway, floats and stairway that extend off the bulkhead. The roadway comes to an end 10 feet before the bulkhead.

Condition Rating
Level of Action Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating Action Description
None
Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
007-198-000-116-100-PHI01A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Tahanto Road - Pocasset River
Based On Comment: 
Earliest Structure Record: Unknown

Date: 10/24/2007
Estimated Reconstruction/Repair Cost: $48,708.00

Length: 1845 Feet NAVD 88
Top Elevation: 18 Feet NGVD
FIRM Map Zone: VE
FIRM Map Elevation: 18

Primary Type: Coastal Beach
Primary Material: Sand
Primary Height: Under 5 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary: The sand beach is visibly layered with gravel. The slope is 1 on 30. There are seawalls and houses directly behind the beach.

Condition Rating: B
Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: V
Action Description: Critical Inshore Structures Present with Potential for Infrastructure Damage and/or High Density Residential Dwellings Condition of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life. (>10 dwellings impacted / 100 feet of shoreline)

Structure Images:
007-199-000-265-100-PHO1A.JPG
007-199-000-265-100-PHO1B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
## CZM Coastal Infrastructure Inventory and Assessment
### Structure Assessment Form

**Property Owner:**
- Local

**Presumed Structure Owner:**
- Local

**Owner Name:**
- Bourne

**Location:**
- Pocasset River

**Based On Comment:**

**Earliest Structure Record:**
- 1961

**Estimated Reconstruction/Repair Cost:**
- $185,632.00

**Date:**
- 10/24/2007

---

**Length:**
- 245 Feet

**Top Elevation:**
- 15 Feet NGVD

**FIRM Map Zone:**
- AE

**FIRM Map Elevation:**
- 15 Feet NGVD

**Primary Type:**
- Bulkhead/Seawall

**Primary Material:**
- Concrete

**Primary Height:**
- Under 5 Feet

**Secondary Type:**
- Revetment

**Secondary Material:**
- Stone

**Secondary Height:**
- Under 5 Feet

**Structure Summary:**
The precast concrete seawall with wave return face is 3.5 feet tall and 2 feet wide. There is scour at the toe of the wall. The wall sits on top of a cast in place concrete wall that has major deterioration. The riprap is dumped in front of the wall. There is a parking lot behind and 3 gangways coming off the wall to floats on the river.

**Condition Rating**
- C
- Fair

**Level of Action Description**
- Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating Action Description**
- I
- None
- Long Term Planning Considerations
- No Inshore Structures or Residential Dwelling Units Present

---

**Structure Images:**
- 007-199-000-265-200-PHO2A.JPG

**Structure Documents:**
- USACE
- March 1961
- Proposed Seawall
- 007-199-000-265-200-COE2A

---

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Pocasset River Bridge
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $42,042.00

Date: 10/24/2007

Length: 35 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: AE
FIRM Map Elevation: 15 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary: The stone revetment is surrounding a bridge abutment. The stones are 1 foot by 1 foot by 2 feet on average. The slope is 1 on 3. There is stone movement. Excessive growth at the tidal zone.

Condition Rating Level of Action Description
D Poor Major Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 007-199-000-265-300-PHO3A.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Property Owner:** Local  
**Presumed Structure Owner:** Local  
**Owner Name:** Bourne  
**Location:** Pocasset River Bridge  
**Based On Comment:**  
**Earliest Structure Record:** Unknown  
**Date:** 10/24/2007  
**Estimated Reconstruction/Repair Cost:** $33,033.00

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<th>Revetment</th>
<th>Primary Material:</th>
<th>Stone</th>
<th>Primary Height:</th>
<th>5 to 10 Feet</th>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
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</thead>
</table>

**Structure Summary:**  
The dumped stones surround the bridge abutment. The stones are approximately 1 foot by 1 foot by 2 feet. The slope is 1 on 3. There is stone movement throughout. Excessive growth in the tidal zone.

**Condition Rating:** C  
**Level of Action Description:** Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide additional material for full protection and extended life.

**Priority Rating Action Description:** II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

**Structure Images:**  
007-199-000-265-400-PHO4A.jpg

**Structure Documents:**

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

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<td>Local</td>
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<td>10/24/2007</td>
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<tr>
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<td>Feet NAVD 88</td>
<td>VE</td>
<td>17 Feet NGVD</td>
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<tr>
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<th>Primary Material:</th>
<th>Primary Height:</th>
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<tbody>
<tr>
<td>Groin/ Jetty</td>
<td>Stone</td>
<td>Under 5 Feet</td>
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</table>

<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
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</thead>
</table>

**Structure Summary:**
The groin is made up of stones that are on average 3 feet by 2 feet. The crest is one stone width. There is slight unraveling at the end of the groin.

**Rating**

- **Condition:** A
- **Level of Action:** None
- **Description:** Like new condition. Structure expected to withstand major coastal storm without damage. Stable landform (beach, dune or bank). Adequate system exists to provide protection from major coastal storm.

**Priority**

- **Rating:** None
- **Action:** Long Term Planning Considerations
- **Description:** No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**

- 007-216-000-053-100-PHO1A.JPEG

**Structure Documents:**

- MA-DCR September 1 Proposed Beach 007-216-000-053-100-DCR1A

Prepared By: Bourne Consulting Engineering
### CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

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<th>Primary Material:</th>
<th>Primary Height:</th>
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<tbody>
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<td>Sand</td>
<td>5 to 10 Feet</td>
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<table>
<thead>
<tr>
<th>Secondary Type:</th>
<th>Secondary Material:</th>
<th>Secondary Height:</th>
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</table>

**Structure Summary:**
The beach is made up of coarse sand and gravel. It is evenly graded. The slope is 1 on 20. There is a parking lot located behind the beach.

<table>
<thead>
<tr>
<th>Condition Rating</th>
<th>Priority Rating</th>
<th>Level of Action Description</th>
<th>Priority Action Description</th>
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<tbody>
<tr>
<td>B Good</td>
<td>Moderate Priority</td>
<td>Minor</td>
<td>Consider for Active Project Improvement Listing</td>
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### Structure Images:
007-216-000-053-200-PHO2A.JPG

### Structure Documents:
MA-DCR | April 1965 | Proposed Beach | 007-216-000-053-200-DCR2A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Barlow's Landing
Based On Comment: Unknown
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $85,272.00

Date: 10/24/2007

Length: 340 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 17 Feet NGVD

Primary Type: Bulkhead/ Seawall
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
The stones are mortared together with concrete. The stones average 2 feet by 1 foot in size. There is erosion behind the top of the wall. There is normal growth along the tidal zone. A gangway attached to floats extends from the middle of the bulkhead. The bulkhead forms the perimeter of a parking lot.

Condition B
Rating Good
Level of Action Minor
Description Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority II
Rating Low Priority
Action Future Project Consideration
Description Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images:
007-216-000-053-300-PHO3A.JPG
007-216-000-053-300-PHO3B.JPG

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Barlow's Landing
Based On Comment:

Earliest Structure Record: 1965
Estimated Reconstruction/Repair Cost: $19,200.00

Length: 80 Feet NAVD 88
Top Elevation: VE 17 Feet NGVD

FIRM Map Zone: FIRM Map Elevation:
Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
A boat ramp has two groins extending along each side. The stones are 3 feet by 4 feet on average with smaller stones used for filling. There is no sign of stone movement.

Condition Rating: B Good
Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: I None
Action Description: Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Structure Images:
007-216-000-053-400-PHO4A.JPG
007-216-000-053-400-PHO4B.JPG
007-216-000-053-400-PHO4C.JPG

Structure Documents:
MA-DCR April 1965 Proposed Beach 007-216-000-053-400-DCR4A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local

Presumed Structure Owner: Local

Owner Name: Bourne

Location: Circuit Avenue

Based On Comment:

Earliest Structure Record: 1960

Estimated Reconstruction/Repair Cost: $116,582.00

Date: 10/24/2007

Length: 920 Feet

Top Elevation: NAVD 88 Feet

FIRM Map Zone: AE

FIRM Map Elevation: 16 Feet NGVD

Primary Type: Coastal Beach

Primary Material: Sand

Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material:

Secondary Height:

Structure Summary:
The sandy beach is well graded. The slope is 1 on 30. There are houses and a road located behind the beach. Adjacent to the beach is a boat ramp.

Condition Rating: B

Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: I

Action Description: None

Long Term Planning Considerations: No Inshore Structures or Residential Dwelling Units Present

Structure Images:
007-221-000-265-100-PHO1A.JPG
007-221-000-265-100-PHO1B.JPG
007-221-000-265-100-PHO1C.JPG
007-221-000-265-100-PHO1D.JPG

Structure Documents:
MA-DCR May 1960 Proposed harbor: 007-221-000-265-100-DCR1A

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

**Structure Assessment Form**

**Property Owner:** Local

**Presumed Structure Owner:** Local

**Owner Name:** Bourne

**Location:** Circuit Avenue

**Based On Comment:**

**Earliest Structure Record:** 1955

**Estimated Reconstruction/Repair Cost:** $36,000.00

**Length:** 150 Feet NAVD 88

**Top Elevation:** 18 Feet NGVD

**FIRM Map Zone:** VE

**FIRM Map Elevation:**

**Primary Type:** Groin/Jetty

**Primary Material:** Stone

**Primary Height:** 5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
The stones are on average 3 feet by 2 feet by 1 foot. The crest of the groin is approximately 5 feet wide. The groin extends past mean low water. A cement walkway has been built on top of the crest, with a pier extending off the end. There is a boat ramp adjacent to the structure.

**Condition**

B

**Rating**

Good

**Level of Action**

Minor

**Description**

Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure/landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent/limit future deterioration and extend life of structure.

**Priority**

1

**Rating**

None

**Action**

Long Term Planning Considerations

**Description**

No Inshore Structures or Residential Dwelling Units Present

**Structure Images:**

[007-221-000-267-100-PHO1A.JPG]

**Structure Documents:**

[USACE] June 1955 Proposed Groin -

[007-221-000-267-100-COE1A]

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner:
Local

Presumed Structure Owner:
Local

Owner Name:
Bourne

Location:
Circuit Avenue

Based On Comment:

Earliest Structure Record:
Unknown

Estimated Reconstruction/Repair Cost:
$15,180.00

Date:
10/24/2007

Length: 230 Feet
Top Elevation: 18 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 18 Feet NGVD

Primary Type: Revetment
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
The boat ramp is surrounded by placed stones. Concrete mortar is used as fill. There is minor stone movement and mortar loss. There is no visible scour.

Condition Rating
B
Good

Priority Rating
I
None

Level of Action
Minor

Action Description
Long Term Planning Considerations
No Inshore Structures or Residential Dwelling Units Present

Description
Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Structure Images:
[007-221-000-267-200-PHO2A.jpg]

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Town: Bourne
Structure ID: 007-246-000-013-100
Key: community-map-block-parcel-structure

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Red Brook Landing

Date: 10/24/2007

Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $53,130.00

Length: 125 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 18 Feet NGVD

Primary Type: Bulkhead/Seawall
Primary Material: Concrete
Primary Height: Under 5 Feet

Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
The concrete seawall surrounds the town boat ramp. There is cracking, spalling, scour at the toe, and exposed rebar. The concrete has begun to deteriorate at the ends of the wall. The wall is heaving outward. A boat yard and store are located behind the wall.

Condition Rating: C
Level of Action Description:
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating: III
Action Description:
Moderate Priority
Consider for Active Project Improvement
Listing
Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images: 007-246-000-013-100-PHOIA.jpg
Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Town: Bourne
Structure ID: 007-261-000-062-100
Key: community-map-block-parcel-structure

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Bourne

Location: Ocean Avenue
Date: 10/24/2007

Based On Comment: 

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $29,878.00

Length: 45 Feet
Top Elevation: 88 Feet NAVD 88
FIRM Map Zone: 
FIRM Map Elevation: 

Primary Type: Revetment
Primary Material: Stone
Primary Height: Under 5 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
The dumped stones are located at the end of Ocean Avenue. The stones are approximately 3 feet by 3 feet by 2 feet on average. The structure is one stone in width and height, and six stones in length. There are smaller stones scattered around the larger stones.

Condition Rating
Level of Action Description
Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storms. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
II Low Priority Future Project Consideration Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 007-261-000-062-100-PHO1A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
Section II - Bourne

Part C

Structure Photographs
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<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
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Section II - Bourne

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST
  • Copies of License Documents

USACE – PERMIT DOCUMENT LIST
  • Copies of Permit Documents
No Town Documents for the Town of Bourne

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<td>October 1, 1998</td>
<td>Plan Accompanying the Petition of the Commonwealth of Massachusetts, Division of Capital Planning and Operations on Behalf of the Massachusetts Maritime Academy To Amend Waterways License # 4613</td>
<td>5</td>
<td>Academy Drive</td>
<td>Bulkhead Maintenance and Riprap Replacement</td>
</tr>
<tr>
<td>007-121-000-051-300</td>
<td>007-121-000-051-300-LIC3C</td>
<td>8851</td>
<td>DEP</td>
<td>Bourne</td>
<td>June 1, 2001</td>
<td>Plan Accompanying Petition of the Commonwealth of Massachusetts, Division of Capital Asset Management</td>
<td>8</td>
<td>Cape Cod Canal/Buzzards Bay</td>
<td>Bulkhead Maintenance</td>
</tr>
<tr>
<td>007-121-000-051-300</td>
<td>007-121-000-051-300-LIC3D</td>
<td>4043</td>
<td>DEP</td>
<td>Bourne</td>
<td>January 27, 1968</td>
<td>Proposed Wharf and Fill at Buzzards Bay at Bourne</td>
<td>3</td>
<td>Massachusetts Maritime</td>
<td>Stone Fill and Timber Bulkhead</td>
</tr>
<tr>
<td>007-160-000-009-000</td>
<td>007-160-000-009-200-LIC2A</td>
<td>3090</td>
<td>DEP</td>
<td>Bourne</td>
<td>September 14, 1968</td>
<td>Proposed Wharf and Fill at Monument Beach by Town of Bourne</td>
<td>1</td>
<td>Monument Beach</td>
<td>Beach Renourishment</td>
</tr>
</tbody>
</table>
PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: JUN 9 8 2004

JOB NO. 4-8075.00 DWG. NO. 5157-03 FILE 8075CH91.DWG

PURPOSE:
PROPOSED NEW & IMPROVEMENT
DREDGING & BEACH NOURISHMENT
IN BUTTERMILK BAY, BOURNE, MA

MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

NEW & IMPROVEMENT
DREDGING & BEACH
NOURISHMENT

PROPOSED NEW & IMPROVEMENT
DREDGING & BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE

APPLICANT:
TOWN OF BOURNE
24 PERRY AVENUE
BOURNE, MA 02532

DATE: AUGUST 8, 2000 SHEET 2 OF 20
NEW & IMPROVEMENT DREDGING & BEACH NOURISHMENT

PURPOSE:
PROPOSED NEW & IMPROVEMENT
DREDGING & BEACH NOURISHMENT
BUTTERMILK BAY, BOURNE, MA

MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

PROPOSED NEW & IMPROVEMENT
DREDGING & BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE

APPLICANT:
TOWN OF BOURNE
24 PERRY AVENUE
BOURNE, MA 02532-

DATE: AUGUST 8, 2000 SHEET 5 OF 20
SECTION A-A
(SEE SHEET 3)

SECTION B-B
(SEE SHEET 3)

SECTION C-C
(SEE SHEET 4)

PE Permit No. 9881
Approved by Department of Environmental Protection
Date: JUN 28 2001
JOB NO. 4-8075.00 DWG. NO. 5157-03 FILE 8075CH91.DWG

PURPOSE:
PROPOSED NEW & IMPROVEMENT
DREDGING & BEACH NOURISHMENT
IN BUTTERMILK BAY, BOURNE, MA

MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

TYPICAL DREDGING SECTIONS

PROPOSED NEW & IMPROVEMENT
DREDGING & BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTAPLE
APPLICANT: BUTTERMILK BAY
TOWN OF BOURNE
24 PERRY AVENUE
BOURNE, MA 02532
DATE: MAY 18, 2001 SHEET 6 OF 20

SCALE: 1" = 100' HORIZONTAL
1" = 10' VERTICAL

0 10 20 VERTICAL FEET
0 100 200 HORIZONTAL FEET

DAVID J.
CRISPIN
CIVIL
No. 32112
PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: JUN 28, 2001

SCALE: 1" = 100'

PURPOSE:
PROPOSED BUTTERMILK BAY
CHANNEL DREDGING/
BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

EXISTING CONDITIONS PLAN

PROPOSED CHANNEL DREDGING/
BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT:
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA 02532
DATE: DEC. 29, 2000 SHEET 9 OF 20
NOTE:
POSITIVE NUMBERS ARE BELOW THE PLANE OF MEAN LOW WATER (MLW). NEGATIVE NUMBERS ARE ABOVE THE PLANE OF MLW.

PERMIT NO. 9981
Approved by Department of Environmental Protection
Date: JUN 28, 2001

SCALE: 1" = 100'

PURPOSE:
PROPOSED BUTTERMILK BAY
CHANNEL DREDGING/
BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

EXISTING CONDITIONS PLAN

PROPOSED CHANNEL DREDGING/
BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT:
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA

THE BSC GROUP, INC.
384 WASHINGTON STREET
PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: JUN 28, 2001

SCALE: 1" = 100'

PURPOSE:
PROPOSED BUTTERMILK BAY CHANNEL DREDGING/BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

GRADING PLAN

PROPOSED CHANNEL DREDGING/BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT:
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA 02532
DATE: DEC. 29, 2000 SHEET 11 OF 20
NOTE:
POSITIVE NUMBERS ARE BELOW THE PLANE OF MEAN LOW WATER (MLW). NEGATIVE NUMBERS ARE ABOVE THE PLANE OF MLW.

PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: Jun 28, 2001

PROPOSE:
PROPOSED BUTTERMILK BAY CHANNEL DREDGING/ BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
364 Washington Street
Norwell, MA 02061.

GRADING PLAN
NOTE:
POSITIVE NUMBERS ARE BELOW THE PLANE OF MEAN LOW WATER (MLW). NEGATIVE NUMBERS ARE ABOVE THE PLANE OF MLW.

PERMIT NO. 8891
Approved by Department of Environmental Protection
Date: JUN 28 2001

SCALE: 1" = 100'

PURPOSE:
PROPOSED BUTTERMILK BAY
CHANNEL DREDGING/B
BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

STILLING BASIN LAYOUT PLAN

PROPOSED CHANNEL DREDGING/B
BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT:
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE,
BOURNE, MA 02532
DATE: DEC. 29, 2000 / SHEET 16 OF 20
SECTION A-A
(SHOWING SETTLING BASIN)
(see sheet 15)

PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: JUN 28 2001
SCALE: 1" = 20' HORZ. & VERT.

PURPOSE:
PROPOSED BUTTERMILK BAY
CHANNEL DREDGING/
BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'
THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

PROPOSED CHANNEL DREDGING/
BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT:
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA 02532
DATE: DEC. 29, 2000 SHEET 17 OF 20
SECTION A-A
FINISHED PROFILE
(SEE SHEET 15)

PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: JUN 28, 2001

SCALE: 1" = 20' HORZ. & VERT.

TYPICAL BEACH NOURISHMENT SECTION

PROPOSED CHANNEL DREDGING/BECCH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT: TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA 02532
DATE: DEC. 29, 2000 SHEET 18 OF 20

JOB NO. 4-8075.00 DWG. NO. 5157-04 FILE DESIGN\8075-ACOE

PROPOSED BUTTERMILK BAY CHANNEL DREDGING/BECCH NOURISHMENT
MLW = 0.5'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061
PERMIT NO. 9931
Approved by Department of Environmental Protection
Date: JUN 28 2001

SCALE: 1" = 60'

UPLAND DISPOSAL AREA AT #15 LEWIS POINT ROAD GRADING PLAN

PROPOSED BUTTERMILK BAY CHANNEL DREDGING/BEACH NOURISHMENT
MLW = 0.0'
MHW = 4.0'
HTL = 4.5'

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

PROPOSED CHANNEL DREDGING/BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT:
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA 02532
DATE: DEC. 29, 2000 SHEET.19 OF 20

NOTE:
NEGATIVE NUMBERS ARE BELOW THE PLANE OF MEAN/LOW WATER (MLW). POSITIVE NUMBERS ARE ABOVE THE PLANE OF MLW.
SECTION E-E

(SEE SHEET 19)

PERMIT NO. 8881
Approved by Department of Environmental Protection
Date: JUN 28 2001

SCALE: 1" = 20' HORIZ. & VERT.

UPLAND DISPOSAL
AREA AT #15
LEWIS POINT ROAD
SECTION PLAN

PROPOSED CHANNEL DREDGING/
BEACH NOURISHMENT
AT: BUTTERMILK BAY
IN: BOURNE, MA
COUNTY OF: BARNSTABLE
APPLICANT: 1,338
TOWN OF BOURNE
SHORE & HARBOUR COMMITTEE
24 PERRY AVE.
BOURNE, MA 02532
DATE: DEC. 29, 2000 SHEET 20 OF 20

THE BSC GROUP, INC.
384 WASHINGTON STREET
NORWELL, MA 02061

JOB NO. 4-8075.00 DWG. NO. 5157-04 FILE DESIGN 8075-ACOE
REV MAY 18, 2001
REV JAN 16, 2001
PROPERTY IDENTIFICATION

1. COMMONWEALTH OF MASSACHUSETTS, TRUSTEES OF STATE COLLEGE (MASS. MARITIME ACADEMY)
2. N/F SUSAN RYAN, 70 ACADEMY DRIVE
3. N/F FRANK J. AND EILEEN M. FORD, 66 ACADEMY DRIVE
4. N/F MARY J. MCLAUGHLIN, 64 ACADEMY DRIVE

NOTES:

1. EXISTING BULKHEAD STRUCTURES WERE BUILT BY COMMONWEALTH OF MASS, DEPARTMENT OF PUBLIC WORKS, DIVISION OF WATERWAYS UNDER CONTRACT #312 (1932) AND CONTRACT #362 (1933). WATERWAYS LICENSES WERE NOT ISSUED.

2. CONTOURS SHOWN THUS ——— ARE AS DEFINED BY FEMA (1985).
NOTES:

1. CONTRACTOR MAY NEED TO DISPLACE EXISTING ROCK TO INSTALL NEW SHEET PILES. PILES ARE 15" THICK. ROCK IS 3± FEET DEEP.

2. VOLUME OF PROPOSED STRUCTURE AND FILL, IS 1450 CY TO MLW
   1647 CY TO MHW

3. VOLUME OF STONE DISPLACEMENT TO INSTALL NEW SHEETING IS 110 CY.
NOTE:
1. CONTRACTOR MAY NEED TO DISPLACE EXISTING ROCK TO INSTALL NEW SHEET PILES. PILES ARE 15" THICK. ROCK IS 3'-2" FEET DEEP.

2. VOLUME OF PROPOSED STRUCTURE AND FILL, IS 1450 CY TO MLW
1647 CY TO MHW

3. VOLUME OF DISPLACEMENT TO INSTALL NEW SHEETING IS 110 CY.
NOTE:

1. NEW SHEETING ALONG EXISTING OPEN PILE WHARF WILL BE 110 FEET LONG, AND WILL NOT REQUIRE ANY DREDGING OR FILLING OF THE WATERWAY.
FACE OF NEW CONCRETE

PROPOSED FENDER PILES AT 16" O.C. ALONG BULKHEAD

MEAN HIGH WATER

MEAN LOW WATER

30'

HP 14 X 73 FENDER PILE

DETAIL 1
SCALE: 1/2"=1'-0"

BULKHEAD SECTION AT PROPOSED FENDER PILE

LICENSE PLAN NO. 4613
Approved by Department of Environmental Protection
Date: MAY 3 1995

FENDER PILE DETAIL

MARK EDWARD SHAMON, CIVIL
No. 35329

REV.3-28-95
SHEET 6 OF 7
NOTES:

1. CONTRACTOR TO PREPARE EXISTING SLOPE BY REMOVAL OF EXISTING ROCK, CONCRETE AND DEBRIS. DREDGE A TRENCH TO TOE-IN THE PROPOSED RIPRAP. PROPOSED RIPRAP REPLACEMENT TO EXTEND 150 FEET FROM BULKHEAD ALONG THE CANAL.

2. VOLUME OF PROPOSED EXCAVATION (DREDGING) IS APPROXIMATELY 200 CY

3. VOLUME OF PROPOSED FILLING (RIPRAP) IS 800 CY TO MLW 1100 CY TO MHW

4. EXIST. RIPRAP EXTENDS FROM TOP OF BANK TO MLW.
SITE PLAN

SCALE: 1"=100'

PLANT ACCOMPANYING THE PETITION OF THE COMMONWEALTH OF MASSACHUSETTS, DIVISION OF CAPITAL PLANNING AND OPERATIONS ON BEHALF OF THE MASSACHUSETTS MARITIME ACADEMY TO AMEND WATERWAYS LICENSE # 4613

LICENSE PLAN NO. 7597

Approved by Department of Environmental Protection of Massachusetts

Elizabeth A. Kelly

OCT 01 1998
VICINITY PLAN

PROPERTY IDENTIFICATION

SCALE: 1:12500

1. COMMONWEALTH OF MASSACHUSETTS, TRUSTEES OF STATE COLLEGE (MASS. MARITIME ACADEMY)

2. N/F SUSAN RYAN, 70 ACADEMY DRIVE

3. N/F FRANK J. AND EILEEN M. FORD, 66 ACADEMY DRIVE

4. N/F MARY J. MCLAUGHLIN, 64 ACADEMY DRIVE

NOTES:

1. PREVIOUS BULKHEAD STRUCTURES WERE BUILT BY COMMONWEALTH OF MASS, DEPARTMENT OF PUBLIC WORKS, DIVISION OF WATERWAYS UNDER CONTRACT #312 (1932) AND CONTRACT #362 (1933). REPLACEMENT OF THE BULKHEAD WAS COMPLETED UNDER WATERWAYS LICENSE NO. 4613.

2. CONTOURS SHOWN THUS ----- ARE AS DEFINED BY FEMA (1985).
TYPICAL CROSS-SECTION OF 36-FOOT LONG, 40-INCH
WIDE JOG IN BULKHEAD ALIGNMENT BETWEEN STATION
5+28 AND 5+64.
RESULTED IN INCREASE IN FILL OF 140 CY
BELOW MLW AND 165 CY BELOW MHW IMPACTED
AREA = 120 SF.

LICENSE PLAN NO. 75-67
Approved by Department of Environmental Protection
Date OCT 01 1996

CROSS SECTION A
SCALE: 1/8"=1'-0"

HST: +3.4
MHW: +2.4
MLW: -1.7
TYPICAL CROSS-SECTION OF RIPRAP PLACEMENT OUTSIDE BULKHEAD BETWEEN STATION 4+25 AND 5+60
IMPACT AREA: 2,000 SF
APPROXIMATELY 225 CY OF FILL WERE PLACED BETWEEN -30 AND -36. AN UNDETERMINED QUANTITY OF RIPRAP SUNK BELOW THE EXISTING MUDLINE.

NEW SHEET PILING

RIPRAP

ELEV. -30±

PREVIOUS MUDLINE (SOFT SOILS)

HST: +3.4
MHW: +2.4
MLW: -1.7

CROSS SECTION B
SCALE: 1/8"=1'-0"

LICENSE PLAN NO. 7597
Approved by Department of Environmental Protection
Date: OCT 01 1998

Ronald Bourgeois

SHEET 4 OF 5
TYPICAL CROSS-SECTION OF RIPRAP REPLACEMENT BETWEEN STATION 6+50 AND 7+42

IMPACT AREA: 1,380 SF

NO CHANGE IN THE VOLUME OF FILL. APPROXIMATELY 130 CY OF RIPRAP WERE REPLACED TO LOCATION THAT WAS RIPRAPPED PRIOR TO CONSTRUCTING THE NEW BULKHEAD.

MHW
MLW

APPROX. EXISTING RIPRAP
APPROX. FINISHED RIPRAP

ELEV. -30±
ELEV. -35

HST: +3.4
MHW: +2.4
MLW: -1.7

CROSS SECTION C
SCALE: 1/8" = 1'-0"

LICENSE PLAN NO. 7597
Approved by Department of Environmental Protection
Date: OCT 01 1998

Ronald M. Barros
PLAN ACCOMPANYING PETITION OF THE COMMONWEALTH OF MASSACHUSETTS, DIVISION OF CAPITAL ASSET MANAGEMENT ON BEHALF OF THE MASSACHUSETTS MARITIME ACADEMY TO LICENSE, RECONSTRUCT, AND MAINTAIN A BULKHEAD AND WHARF AND LICENSE CONSTRUCT AND MAINTAIN FLOATING DOCKS IN BUZZARDS BAY, TOWN OF BOURNE, MA FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BURLINGTON, MASS.

LICENSE PLAN NO. 8851
Approved by Department of Environmental Protection of Massachusetts

Elizabeth A. Kurland

James O. Finlayson
NEW BOTTOM ANCHORED FLOATING DOCK, TO BE LICENSED

180'

-28.6
REALIGN EXISTING FLOATING DOCK

18' - 0''
13' - 6''

C

CB

SEWAGE FORCE MAIN APROX. 500 FT TO EXISTING LINE

SEWER LIFT STATION

NEW STEEL SHEET PILE BULKHEAD TO BE LICENSED

RELOCATED MARINE OPERATIONS BUILDING TO BE LICENSED

NOTE:
WHARF UTILITY CONNECTIONS WILL INCLUDE WATER, SEWER, STEAM AND ELECTRIC POWER

-31.3

UTILITY TRENCH

-31.5

WATER QUALITY INLET
-35.9

-28.7

48' - 6''

B

LIFE BOAT DAVIT

EXIST CB

LIMIT OF NEW PAVEMENT CB

TRANSFORMER PAD

B SURVEY

34.0
170' ±

HISTORIC DREDGE FOOT PRINT

APPROX. FEDERAL CHANNEL LINE

FLOOD

EBB

CAPE COD CANAL

WHARF RECONSTRUCTION PLAN

0
100

SCALE 1'' = 100'

LICENSE PLAN NO. 8851

Approved by Department of Environmental Protection

Date: JUN 0 1 2001
DECEMBER 18, 2000 SHEET 2 OF 8
PLAN ACCOMPANYING PETITION OF THE COMMONWEALTH OF MASSACHUSETTS, DIVISION OF CAPITAL ASSET MANAGEMENT ON BEHALF OF THE MASSACHUSETTS MARITIME ACADEMY TO LICENSE, RECONSTRUCT, AND MAINTAIN A BULKHEAD AND WHARF AND LICENSE CONSTRUCT AND MAINTAIN FLOATING DOCKS IN BUZZARDS BAY, TOWN OF BOURNE, MA FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BURLINGTON, MASS.

LICENSE PLAN NO. 8851
Approved by Department of Environmental Protection
Date: JUN 01 2001
DECEMBER 18, 2000 SHEET 3 OF 8

LICENSE PLAN NO. 8851
Approved by Department of Environmental Protection
Date: JUN 01 2001 DECEMBER 18, 2000 SHEET 4 OF 8
LICENSE PLAN NO. 8951

SECTION
SCALE: 1" = 10' - 0"

30' GANGWAY

EXISTING MOORING PLATFORM
BOLLARD TO BE REMOVED

50' WALKWAY

MHW EL. 4.1

MLW EL. 0.0

EXISTING PILES

CONCRETE CAP FOR WALKWAY SUPPORT

PLAN ACCOMPANYING PETITION OF THE COMMONWEALTH OF MASSACHUSETTS, DIVISION OF THE MASSACHUSETTS MARITIME ACADEMY TO LICENSE, RECONSTRUCT, AND MAINTAIN A BULKHEAD AND WHARF AND LICENSE CONSTRUCT AND MAINTAIN FLOATING DOCKS IN BUZZARDS BAY TOWN OF BOURNE, MA.

LICENSE PLAN NO. 8951

APPROVED
DEPARTMENT OF CONSTRUCTION
DECEMBER 18, 2000. SHEET 5 OF 8

UNITED STATES
COMMONWEALTH
OF MASSACHUSETTS

DONALD D. WOOL
BURLINGTON, MASS.

FAY, SPOFFORD & THORNHILL, INC. ENGINEERS

12'-0"

WATER

FLOAT

ANCHOR BLOCK (TYP)

ANCHOR CHAIN

GROUND LINE VARIgetic

SECTION A-A
NOT TO SCALE
BUZZARD'S BAY
LICENSE PLAN NO. 8851

PLAN ACCOMPANYING PETITION OF THE COMMONWEALTH OF MASSACHUSETTS, DIVISION OF CAPITAL ASSET MANAGEMENT ON BEHALF OF THE MASSACHUSETTS MARITIME ACADEMY TO LICENSE, RECONSTRUCT, AND MAINTAIN A BULKHEAD AND WHARF AND LICENSE CONSTRUCT AND MAINTAIN FLOATING DOCKS IN BUZZARDS BAY, TOWN OF BOURNE, MA
FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS BURLINGTON, MASS.

DEC. 18, 2000 SHEET 6 OF 8
**LIST OF ABUTTERS**

<table>
<thead>
<tr>
<th>Number</th>
<th>Name and Address</th>
</tr>
</thead>
</table>
| 1      | BEVERLY ADOMAITIS  
Capeway Tours, Inc.  
31 Milk Street, Mezzanine Level  
Boston, MA 02109  
(15 Buttermilk Way) |
| 2      | ROBERT & RITA PACHECO TRUSTEES  
ATLANTIC TRUST  
11 Buttermilk Way  
Buzzards Bay, MA 02532  
(11 Buttermilk Way) |
| 3      | ROBERT & RITA PACHECO TRUSTEES  
ATLANTIC TRUST  
11 Buttermilk Way  
Buzzards Bay, MA 02532  
(9 Buttermilk Way) |
| 4      | JOSEPH & SANDRA FEROLITO  
7 Buttermilk Way  
Buzzards Bay, MA 02532 |
| 5      | W. H. CLARK & J. F. CLARK TRUSTEES  
W. CLARK TRUST  
33 N. Main Street  
Falmouth, MA 02540  
(16 Tower Lane) |
| 6      | ROBERT & RITA PACHECO TRUSTEES  
ATLANTIC TRUST  
11 Buttermilk Way  
Buzzards Bay, MA 02532  
(20 Tower Lane) |
| 7      | PATRICIA BARBER, TRUSTEE  
22 Bay Drive Realty Trust  
5215 S. Bridget Point  
Floral City, FL 34436  
(22 Bay Drive) |
| 16     | RONALD & JANICE MCHUGH  
5121 SW 210 Terrace  
Ft. Lauderdale, FL 33332-1512  
(20 Bay Drive) |
| 17     | WILLIAM & DEBRA BERNARDINELLI  
15 Laurel Street  
Wakefield, MA 01880  
(11 Salt Works Lane)  
(Buzzards Bay, MA 02532) |
| 18     | JOHN SILVA  
9 Salt Works Lane  
Buzzards Bay, MA 02532 |
| 19     | WARREN & JOAN HUBNER  
59 Bourne Neck Drive  
Buzzards Bay, MA 02532 |
| 20     | GEORGE & ROSE D'AMATO  
436 Canton Street  
Westwood, MA 02090-2212  
(6 Tower Lane) |
| 21     | FRANK & JULIA FLORIO  
10 Nahant Avenue  
Milton, MA 02186  
(6 Tower Lane) |
| 22     | MARGARET BUTLER &  
KATHLEEN DALZELL  
10 Tower Lane  
Buzzards Bay, MA 02532 |

**NOTE:** The property address is shown in parenthesis when different from the mailing address.

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**LICENSE PLAN NO. 8851**

Approved by Department of Environmental Protection  
Date: JUN 01 2002  
December 18, 2000 Sheet 7 of 8
LIST OF ABUTTERS (CONTINUED)

GREGORY & EUGENIA CORAS, CO TRUSTEES
THE EUGENIA FAMILY REALTY TRUST
PO BOX 510
FORESTDALE, MA 02644
(12 TOWER LANE)

EVELYN INMAN & PHYLLIS MYERS
TRUSTEES OF THE
TOWER LANE REALTY TRUST
4 TOWER LANE
BUZZARDS BAY, MA 02532

ROBERT & BETTY RUSSELL
23 LINCOLN AVENUE
WINCHENDON, MA 01475
(62 BOURNE NECK DRIVE)

MICHAEL & ELEANORE SHEA
65 ACADEMY DRIVE
BUZZARDS BAY, MA 02532

LANE A. GAULIN, TRUSTEE
SPECIAL K'S REALTY TRUST
67 ACADEMY DRIVE
BUZZARDS BAY, MA 02532

MASSACHUSETTS MARITIME ACADEMY
(OWNER)

COMM OF MA BOARD OF TRUSTEE
OF STATE COLLEGES
ACADEMY DRIVE
BUZZARDS BAY, MA 02532

SUSAN RYAN
109 WOOD DRIVE
E. HARTFORD, CT 06108-1210
(70 ACADEMY DRIVE)

FRANK J. & EILEEN FLOOD
68 ACADEMY DRIVE
BUZZARDS BAY, MA 02532

MARY MCLAUGHLIN
64 ACADEMY DRIVE
BUZZARDS BAY, MA 02532

CHARLOTTE OGILVY
62 ACADEMY DRIVE
BUZZARDS BAY, MA 02532

JOSEPH F. CURLEY
60 ACADEMY DRIVE
BUZZARDS BAY, MA 02532

TOWN OF BOURNE
BEACH AREA TAYLORS POINT
24 PERRY AVENUE
BUZZARDS BAY, MA 02532

PLAN ACCOMPANYING PETITION OF THE
COMMONWEALTH OF MASSACHUSETTS, DIVISION
OF CAPITAL ASSET MANAGEMENT ON BEHALF
OF THE MASSACHUSETTS MARITIME ACADEMY
TO LICENSE, RECONSTRUCT, AND MAINTAIN A
BULKHEAD AND WHARF AND LICENSE
CONSTRUCT AND MAINTAIN FLOATING DOCKS
IN BUZZARDS BAY, TOWN OF BOURNE, MA
FAY, SPOFFORD & THORNDIKE, INC. ENGINEERS
BURLINGTON, MASS.

LICENSE PLAN NO. 8851
Approved by Department of Environmental Protection
Date: JUL 1, 2001
DECEMBER 18, 2000 SHEET 8 OF 8
PROPOSED BULKHEAD & WHARF

BUZZARDS BAY AT BOURNE
BARNSTABLE COUNTY
MASSACHUSETTS

LOCATION MAP

SCALE OF MILES

0 1 2

TRACED FROM MASS. D.P.W. ONSET QUADRANGLE AND POCASSET QUADRANGLE

LICENSE PLAN NO. 4043
APPROVED BY DEPARTMENT OF PUBLIC WORKS
JANUARY 27, 1958

COMMISSIONER OF PUBLIC WORKS
ASSOCIATE COMMISSIONERS
PROPOSED WHARF AND FILL AT MONUMENT BEACH BY TOWN OF BOURNE
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
<th>Municipality</th>
<th>Date</th>
<th>Title</th>
<th>Sheets</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>007-026-000-004-100</td>
<td>007-026-000-004-100-COE1A</td>
<td>52-212</td>
<td>USACE</td>
<td>Bourne</td>
<td>August 1952</td>
<td>Proposed Groin Construction and Reconstruction - Sagamore Beach - Bourne, Massachusetts - Application by the DPW of Massachusetts - Division of Waterways</td>
<td>2</td>
<td>Sagamore Beach - Phillips Road</td>
<td>Groins</td>
</tr>
<tr>
<td>007-026-000-004-100</td>
<td>007-026-000-004-100-COE1B</td>
<td>52-241</td>
<td>USACE</td>
<td>Bourne</td>
<td>November 1952</td>
<td>Proposed Groin - Sagamore Beach - Bourne, Massachusetts - Application by the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Sagamore Beach - Phillips Road</td>
<td>Groin</td>
</tr>
<tr>
<td>007-117-000-042-100</td>
<td>007-117-000-042-100-COE1A</td>
<td>51-354</td>
<td>USACE</td>
<td>Bourne</td>
<td>July 1980</td>
<td>Proposed Groin - Bourne Manor - All Taysors Point In Bourne, Massachusetts - County of Barnstable - Application by Massachusetts Dept. of Environmental Quality Engineering - Division of Land and Water Use</td>
<td>3</td>
<td>Wright Lane</td>
<td>Riprap Slope</td>
</tr>
<tr>
<td>007-121-000-051-200</td>
<td>007-121-000-051-200-COE2A</td>
<td>54-165</td>
<td>USACE</td>
<td>Bourne</td>
<td>June 1954</td>
<td>Proposed Fill and Riprap - Pier Road at State Pier - Cape Cod Canal - Bourne, Massachusetts - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Pier Road</td>
<td>Revetment</td>
</tr>
<tr>
<td>007-150-000-009-200</td>
<td>007-160-000-009-200-COE2A</td>
<td>56-204</td>
<td>USACE</td>
<td>Bourne</td>
<td>October 1948</td>
<td>Proposed Wharf and Fill at Monument Beach by Town of Bourne</td>
<td>1</td>
<td>Monument Beach</td>
<td>Filled Wharf</td>
</tr>
<tr>
<td>007-195-000-265-200</td>
<td>007-195-000-265-200-COE2A</td>
<td>61-146</td>
<td>USACE</td>
<td>Bourne</td>
<td>March 1961</td>
<td>Proposed Seawall, Docking Facilities, Mooring Piles and Excavation - Pocasset River - Bourne, Massachusetts - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>2</td>
<td>Pocasset River</td>
<td>Seawall</td>
</tr>
<tr>
<td>007-221-000-267-100</td>
<td>007-221-000-267-100-COE1A</td>
<td>55-173</td>
<td>USACE</td>
<td>Bourne</td>
<td>June 1955</td>
<td>Proposed Groin - Pocasset Beach - Red Brook Harbor - Bourne, Massachusetts - Prepared for the DPW of Massachusetts - Division of Waterways</td>
<td>1</td>
<td>Circuit Avenue</td>
<td>Groin</td>
</tr>
</tbody>
</table>
PLAN

Scale - Feet

See Sheet 2
For Abutters.
Proposed work
shown in red.

NOTE:
Soundings are in feet and tenths
and show depths below the plane of
Mean Low Water. Minus figures show
elevations above the same plane.

PROPOSED GROIN
CONSTRUCTION & RECONSTRUCTION
SAGAMORE BEACH
BOURNE, MASS.
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS
DIVISION OF WATERWAYS
AUGUST 1952

Revised Sept 23, 1952
NOTE
Proposed work shown in red.
Elevations are in feet and tenths
above the plane of mean low water.
Minus figures show depths below
the same plane.

PROPOSED GROIN
SAGAMORE BEACH
BOURNE, MASS.
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS
DIVISION OF WATERWAYS
NOVEMBER 1952

DISTRICT WATERWAYS ENGINEER

ACC. 03041
PURPOSE: TO CONSTRUCT A 105 SLIP PUBLIC MUNICIPAL RECREATIONAL MARINA.

DATUM: N.G.V.D.

NOTE: APPROXIMATELY 120,800 C.Y. OF GRANULAR MATERIAL TO BE DREDGED TO ELEVATION -0.0 N.G.V.D. OF WHICH 110,000 C.Y. WILL BE TRUCKED AND DISPOSED AT THE Bourne LAND FILL SITE, 10,500 C.Y. WILL BE USED ON SITE FOR FILL OF PARKING AREA AND SERVICE BUILDING AREA.

PROPERTY OWNERS

1. CONRAIL REAL ESTATES DEPT., 744 BROAD STREET, SUITE 423, NEWARK, N.J.
2. LEO SALHAN, 322 BROADWAY, PAWTUCKET, R.I.
3. MANUEL J. ROSE, 48 BUTTERMILK WAY, BUZZARDS BAY, MA
4. MAURICE FORD, 51 WORLEY STREET, W. RONKERY, MA
5. THOMAS FORD, 7 HARBOR PLACE, BUZZARDS BAY, MA
6. MARY VERRIER, 14 WRIGHT LANE, BUZZARDS BAY, MA
7. BRIAN SULLIVAN & JOSEPH SILVIA, 144 CROSS STREET, BELMONT, MA
8. ELEANOR R. BODREICK, BROLANDS, UPTON, MA
9. THEISEE LOISEAU, BOX 880, 8 WRIGHT LANE, BUZZARDS BAY, MA
10. JOSEPH DISGIOVANNI, 52 NORRIS AVENUE, PAWTUCKET, R.I.
11. BRIAN SULLIVAN & JOSEPH SILVIA, 144 CROSS STREET, BELMONT, MA

PROPOSED BOURNE MARINA
AT TALYORS POINT
IN BOURNE, MASSACHUSETTS
COUNTY OF BARNSTABLE STATE OF MASS.
APPLICATION BY MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING–DIVISION OF LAND AND WATER USE

SHEET 1 OF 1 DATE: JULY, 1980
NOTE
ELEVATIONS ARE IN FEET AND TENTHS
AVERAGES OF MEAN LOW WATER
MINUS FIGURES SHOW DEPTHS BELOW
THE SAME PLANE.
LOCATION OF WORK TO BE DONE IS
SHOWN IN RED.

PROPOSED FILL AND RIPRAP
PIER ROAD & STATE PIER
CAPE COD CANAL
BOURNE - MASS.
APPROVAL BY
DEPARTMENT OF PUBLIC WORKS - MASSACHUSETTS
DIVISION OF WATERWAYS
JUNE 1954
SCALES SHOWN

Robert B. Masten
DISTRICT WATERWAYS ENGINEER
PROPOSED WHARF AND FILL AT MONUMENT BEACH 
BY TOWN OF BOURNE 
OCT. 1948
NOTES
ELEVATIONS ARE IN FEET AND TENTHS AND REFER TO PLANE OF MEAN LOW WATER. MINUS FIGURES SHOW DEPTHS BELOW THE SAME PLAN.
EXCAVATED MATERIAL, APPROX. 7000 CU. YDS., TO BE DEPOSITED AS BACKFILL OR GRADING WHERE AND IF SATISFACTORY FOR THE PURPOSE. ANY EXCESS TO BE PLACED IN APPROVED LOCATIONS.
ALL PILE AND SPUR PILE DRIVING, TIMBER FLOATS (STYROFOAM SUPPORTS) TRAVELER, IRONS AND OTHER HARDWARE TO BE OF STANDARD USAGE.
LOCATION OF WORK TO BE DONE SHOWN IN RED.
NOTE

ELEVATIONS ARE IN FEET AND TENTHS
ABOVE THE PLANE OF MEAN LOW WATER.
MINUS FIGURES SHOW DEPTHS BELOW
THE SAME PLANE.

LOCATION OR PROPOSED WORK IS
SHOWN IN RED.

PROPOSED GROIN
POCASSET BEACH
RED BROOK HARBOR
BOURNE - MASS.

APPLICATION OF
DEPARTMENT OF PUBLIC WORKS - MASSACHUSETTS
DIVISION OF WATERWAYS
JUNE 1955

Robert B. MacKinnon
DISTRICT WATERWAYS ENGINEER
Section III

Sandwich
Section III – Community Findings – Town of Sandwich

COMMUNITY DESCRIPTION

The Town of Sandwich consists of a land area of 43.04 square miles out of a total area of 44.36 square miles and had a population of 20,136 in the 2000 census. The Town is located on Cape Cod of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline is 10 miles that are directly exposed to open ocean. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Sandwich, there were 6 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 4 in Section III-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>STRUCTURE TYPE AND QUANTITY - Town of Sandwich</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Structure (f)</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
</tr>
<tr>
<td>Revetment</td>
</tr>
<tr>
<td>Breakwater</td>
</tr>
<tr>
<td>Groin / Jetty</td>
</tr>
<tr>
<td>Coastal Dune</td>
</tr>
<tr>
<td>Coastal Beach</td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Sandwich’s case there are a total of 6 structures which would require approximately $ 5.3 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $ 4.8 million would be required to upgrade the Town’s coastal protection.
STRUCTURE REPAIR / RECONSTRUCTION COST - Town of Sandwich

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkhead / Seawall</td>
<td>2</td>
<td>$295,495</td>
<td></td>
<td></td>
<td></td>
<td>$295,495</td>
</tr>
<tr>
<td>Breakwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ -</td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td>4</td>
<td>$252,210</td>
<td>$2,704,997</td>
<td>$2,099,364</td>
<td>$5,028,571</td>
<td></td>
</tr>
<tr>
<td>Coastal Dune</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ -</td>
</tr>
<tr>
<td>Coastal Beach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ -</td>
</tr>
</tbody>
</table>

6 $ - $295,495 $252,210 $2,704,997 $2,099,364 $5,322,066

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Sandwich, the breakdown of structures by assumed ownership is as follows:

STRUCTURE OWNERSHIP / REPAIR COST - Town of Sandwich

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Owned</td>
<td>6</td>
<td>$295,495</td>
<td>$252,210</td>
<td>$2,704,997</td>
<td>$2,099,364</td>
<td>$5,322,066</td>
</tr>
<tr>
<td>Commonwealth of Massachusetts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ -</td>
</tr>
<tr>
<td>Federal Government Owned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ -</td>
</tr>
<tr>
<td>Unknown Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ -</td>
</tr>
</tbody>
</table>

6 $ - $295,495 $252,210 $2,704,997 $2,099,364 $5,322,066

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section III-B which contains Structure Assessment Reports for each individual structure found.

SUMMARY

The enclosed reports and associated documents reflects the Town of Sandwich’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section III - Sandwich

Part B

Structure Assessment Reports
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Sandwich

Location: Scorton Creek
Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $252,210.00

Date: 10/11/2007

Length: 210 Feet
Top Elevation: 5 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
This structure is the west jetty at Scorton Creek. The crest elevation is low and the armor is becoming unraveled at structure head. The beach has filled in the updrift side of the jetty.

Condition Rating
C Fair

Level of Action Description
Moderate
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

Priority Rating Action Description
III Moderate Priority
Consider for Active Project Improvement
Listing
Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
066-071-000-034-100-PH01A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Sandwich

Location: Scorton Creek
Based On Comment:
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $792,792.00

Date: 10/11/2007

Length: 330 Feet
Top Elevation: 3 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 15 Feet NGVD

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
This structure is the east jetty at Scorton Creek. The armor stone is completely unraveled and shows no interlocking. There is no distinct crest or side slopes.

Condition Rating Level of Action Description
D Poor Major Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images: 066-071-000-034-200-PHO2A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local

**Location:** Sandwich Marina

**Date:** 10/11/2007

**Presumed Structure Owner:** Local

**Based On Comment:**

**Earliest Structure Record:** Unknown

---

**Length:** 840 Feet

**Top Elevation:** 10 Feet NGVD

**FIRM Map Zone:** AE

**FIRM Map Elevation:**

---

**Primary Type:** Revetment

**Primary Material:** Stone

**Primary Height:** 5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

---

**Structure Summary:**

This structure is the stone revetment around the west side of the Sandwich Marina basin. The armor stone is weathered but in good condition. The crest and side slopes show good lines and are in good condition.

**Condition Rating**

- **Description:** Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority Rating Action**

- **Description:** Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

**Structure Images:**

- [066-092-000-003-100-PHO1A.jpg](066-092-000-003-100-PHO1A.jpg)

**Prepared By:** Bourne Consulting Engineering
**Structure Assessment Form**

**Property Owner:** Local  
**Presumed Structure Owner:** Local  
**Owner Name:** Sandwich

**Location:** Sandwich Marina  
**Based On Comment:**  
**Earliest Structure Record:** Unknown  
**Estimated Reconstruction/Repair Cost:** $194,594.00

**Length:** 1620 Feet  
**Top Elevation:** 10 Feet NAVD 88  
**FIRM Map Zone:** AE  
**FIRM Map Elevation:** 10 Feet NGVD

**Primary Type:** Revetment  
**Primary Material:** Stone  
**Primary Height:** 5 to 10 Feet  
**Secondary Type:**  
**Secondary Material:**  
**Secondary Height:**

**Structure Summary:**
This structure is the stone revetment around east side of the Sandwich Marina basin. The armor stone is weathered but in good condition. The crest and side slopes show good lines and are in good condition.

**Condition**  
**Rating** Good  
**Level of Action** Minor  
**Description** Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

**Priority**  
**Rating** Good  
**Action** Consider for Active Project Improvement Listing  
**Description** Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

**Structure Images:**
[066-092-000-003-200-PH02A.jpg]

**Structure Documents:**

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment
Structure Assessment Form

Property Owner: Local  Location: Town Beach  Date: 10/11/2007
Presumed Structure Owner: Local  Based On Comment:
Owner Name: Sandwich  Earliest Structure Record: 1953

Estimated Reconstruction/Repair Cost: $1,912,205.00

<table>
<thead>
<tr>
<th>Length:</th>
<th>Top Elevation:</th>
<th>FIRM Map Zone:</th>
<th>FIRM Map Elevation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1440</td>
<td>6</td>
<td>VE</td>
<td>16</td>
</tr>
<tr>
<td>Feet</td>
<td>Feet NAVD 88</td>
<td></td>
<td>Feet NGVD</td>
</tr>
</tbody>
</table>

Primary Type: Groin/ Jetty  Primary Material: Stone  Primary Height: Under 5 Feet
Secondary Type: Secondary Material: Secondary Height:

Structure Summary:
This structure is the 9 groins from turn in Freeman Avenue, east to Old Harbor. All groins exhibit unraveled armor stone. Many are becoming flanked at high tide.

Condition | D  | Priority | I |
Rating     | Poor | Rating    | None |
Level of Action | Major | Action    | Long Term Planning Considerations |
Description | Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm. | Description | No Inshore Structures or Residential Dwelling Units Present |

Structure Images:
[066-093-000-009-100-PHO1A.jpg]

Structure Documents:

<table>
<thead>
<tr>
<th>USACE</th>
<th>January 195</th>
<th>Proposed Stone</th>
<th>066-093-000-009-100-COE1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>USACE</td>
<td>July 1956</td>
<td>Proposed Groin-</td>
<td>066-093-000-009-100-COE1B</td>
</tr>
<tr>
<td>USACE</td>
<td>October 195</td>
<td>Proposed Groins-</td>
<td>066-093-000-009-100-COE1C</td>
</tr>
<tr>
<td>USACE</td>
<td>March 1966</td>
<td>Proposed Shore</td>
<td>066-093-000-009-100-COE1D</td>
</tr>
<tr>
<td>MA-DCR</td>
<td>December 1</td>
<td>Proposed Shore</td>
<td>066-093-000-009-100-DCR1A</td>
</tr>
<tr>
<td>MA-DCR</td>
<td>June 1956</td>
<td>Proposed Shore</td>
<td>066-093-000-009-100-DCR1B</td>
</tr>
<tr>
<td>MA-DCR</td>
<td>September 1</td>
<td>Proposed Shore</td>
<td>066-093-000-009-100-DCR1C</td>
</tr>
<tr>
<td>MA-DCR</td>
<td>December 1</td>
<td>Proposed Shore</td>
<td>066-093-000-009-100-DCR1D</td>
</tr>
<tr>
<td>MA-DCR</td>
<td>March 1966</td>
<td>Proposed Shore</td>
<td>066-093-000-009-100-DCR1E</td>
</tr>
</tbody>
</table>

Prepared By: Bourne Consulting Engineering
Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Sandwich

Location: Old Sandwich Harbor
Based On Comment:

Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $2,069,364.00

Date: 10/11/2007

Length: 610 Feet
Top Elevation: 0 Feet NAVD 88
FIRM Map Zone: VE
FIRM Map Elevation: 16 Feet NGVD

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 10 to 15 Feet

Secondary Type: Secondary Material:
Secondary Height:

Structure Summary:
This structure is the stone jetties at the entrance to Old Sandwich Harbor. The inlet is no longer contained within the jetties and so the structures are non-functional. The west jetty is exposed at low tide and in poor condition. The east jetty is submerged at all tides.

Condition Rating
Level of Action Description
Critical Immediate
Conditions of structure/landform may warrant emergency stabilization as failure may result in potential loss of property and/or life. Landform eroded, loss of integrity. Structure exhibits critical levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure provides little or no protection from a major coastal storm. Actions taken to totally reconstruct structure to regain full capacity. Landform stability is severely compromised, rate of erosion/material loss may be increasing, and landform does not provide adequate protection from a major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing
Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images: 066-093-000-012-100-PH01A.jpg

Structure Documents:

Prepared By: Bourne Consulting Engineering
Section III - Sandwich

Part C

Structure Photographs
<table>
<thead>
<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Contract/ Drawing Number</th>
<th>Entity</th>
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<td>Structure Location</td>
<td>Structure Condition Photo at Time of Survey</td>
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Section III - Sandwich

Part D

Structure Documents

TOWN DOCUMENT LIST

MA DCR - DOCUMENT LIST

MA DEP – Ch 91 DOCUMENT LIST

- Copies of License Documents

USACE – PERMIT DOCUMENT LIST

- Copies of Permit Documents
No Town Documents for the Town of Sandwich

<table>
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<tr>
<th>BCE Structure No</th>
<th>Document No</th>
<th>Complex/</th>
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<td>Town Neck Beach</td>
<td>Groin</td>
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</table>
NOTE
ELEVATIONS ARE IN FEET AND TENTHS
ABOVE THE PLANE OF MEAN LOW WATER.
MINUS FIGURES SHOW DEPTHS BELOW
THE SAME PLANE.
LOCATION OF PROPOSED WORK SHOWN IN RED.
NOTE

Proposed work shown in red.
Elevations are in feet and tenths above the plane of mean low water.
Minus figures show depths below the same plane.
NOTE

ELEVATIONS ARE IN FEET AND TENTHS
AND REFER TO PLANE OF MEAN LOW WATER
MINUS FIGURES SHOW DEPTHS BELOW THE
SAME PLANE.

APPROX. LOCATION OF GROUND SURFACE
IS SHOWN THEREFORE.

ALL SIDE AND END SLOPES FOR GROINS
TO BE 1.5 TO 1.

LOCATION OF PROPOSED WORK IS SHOWN
IN RED.

PROPOSED GROINS
TOWN NECK BEACH
CAPE COD BAY
SANDWICH - MASS.
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS - MASSACHUSETTS
DIVISION OF WATERWAYS
OCTOBER 1957

CHIEF WATERWAYS ENGINEER
GENERAL NOTES:
Elevations are in feet and
Tenths and Refer to the
Plots of Mean Low Water
Refer to Transit Book No. 463
Survey made Sept. 1964
Location of Proposed Work
Shown in Red

PLAN
Scale 1" = 200'

TYPICAL PROFILE OF GROINS
Scale 1" = 50'

PROPOSED SHORE PROTECTION
GROIN CONSTRUCTION
TOWN NECK BEACH
CAPE COD BAY
SANDWICH
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS
DIVISION OF WATERWAYS
MARCH 1966

John T. Harmon
DEPUTY CHIEF ENGINEER FOR WATERWAYS
ACM 04530
PROPOSED SHORE PROTECTION
GROIN CONSTRUCTION
TOWN NECK BEACH
CAPE COD BAY
SANDWICH
APPLICATION BY
DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS
DIVISION OF WATERWAYS
MARCH 1966

John T. Hannan, Jr.
DEPUTY CHIEF ENGINEER FOR WATERWAYS
ACC. 04520
Section IV

Mashpee
Section IV – Community Findings – Town of Mashpee

COMMUNITY DESCRIPTION

The Town of Mashpee consists of a land area of 23.48 square miles out of a total area of 27.24 square miles and had a population of 12,946 in the 2000 census. The Town is located on Cape Cod of Massachusetts and its location can be seen on this report’s cover. The estimated length of shoreline is 7 miles that are directly exposed to open ocean. The Town is protected from major coastal storms by both natural and man-made shoreline structures that require maintenance to insure the long term protection of its coastline. The man-made and publicly owned structures that protect the Town were investigated for their ability to provide adequate protection from major coastal storms. Structures have been identified as publicly owned, including coastal dunes and beaches, based on evidence of investment of public funds made to create/enhance/maintain these structures. The assessment did not include floating or pile supported structures as they are assumed not to provide any significant coastal protection from major storm events.

STRUCTURE INVENTORY

Within the Town of Mashpee, there were 4 structures which had public or unknown ownership which provide significant coastal protection. The location of the structures can be seen in Sheets 1 through Sheet 4 in Section IV-B of this report. The structures were categorized by their type and by their structural condition based on a preliminary field assessment. The distribution of structures by type and condition can be seen in the following table:

<table>
<thead>
<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Length</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Bulkhead / Seawall</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Revetment</td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Breakwater</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Coastal Dune</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Within the above table, the total length of each type of structure is also provided. The structures are listed by the type which is providing the primary coastal protection. Many sites have multiple structure types at the same location (i.e. revetment in front of seawall). These secondary structures, although not identified within these tables, are included in the development of repair/rehabilitation costs.

The development of repair costs has been included by structure type and by condition. In the Town of Mashpee’s case there are a total of 4 structures which would require approximately $ 3.2 million to bring all the coastal structures to “A” Rating. Most critical will be the structures in the “D” and “F” classifications as those are assumed to undergo some level of damage or failure during the next major coastal storm event. To reconstruct these structures, identified in the preliminary survey as being in poor condition, an estimated $ 1.9 million would be required to upgrade the Town’s coastal protection.
STRUCTURE REPAIR / RECONSTRUCTION COST - Town of Mashpee

<table>
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<tr>
<th>Primary Structure (1)</th>
<th>Total Structures</th>
<th>Structure Condition Rating</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
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<tr>
<td>Bulkhead / Seawall</td>
<td>1</td>
<td>$</td>
<td>177,177</td>
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<tr>
<td>Revetment</td>
<td>2</td>
<td>$</td>
<td>76,184</td>
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<tr>
<td>Breakwater</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Groin / Jetty</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Coastal Dune</td>
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<td></td>
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<tr>
<td>Coastal Beach</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

| Total                   | $ 1,172,312 | $ 177,177 | $ 1,873,872 | $             | $ 3,223,361 |

Based on the limited research within the scope of this project research, the presumed ownership of the structures was established on an initial basis and would be subject to more intense review in future tasks. Structures identified as being owned privately were excluded from further consideration. Although ownership of the land on which the structure was located was a factor, the structure ownership was treated as a separate issue from land ownership. For the Town of Mashpee, the breakdown of structures by assumed ownership is as follows:

STRUCTURE OWNERSHIP / REPAIR COST - Town of Mashpee

<table>
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<tr>
<th>Primary Structure (1)</th>
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<th>Structure Condition Rating</th>
<th>Total Cost</th>
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<td>Commonwealth of Mass.</td>
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</tr>
<tr>
<td>Unknown Ownership</td>
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<td></td>
</tr>
</tbody>
</table>

| Total                   | $ 1,172,312 | $ 177,177 | $ 1,873,872 | $             | $ 3,223,361 |

The identification of presumed ownership was not based on the investigation of legal documents but relied on property ownership and from construction and regulatory documents that were found. A more detailed investigation of legal documents and agreements would be required where structure ownership is disputed. A more detailed identification of structure type, length, condition and location can be found in Section IV-B which contains Structure Assessment Reports for each individual structure found.

SUMMARY

The enclosed reports and associated documents reflects the Town of Mashpee’s coastal structure information that will eventually be input into a state-wide GIS database and will be accessible through MassGIS. This data, when compiled state-wide, will be critical in the development of both short term and long term planning for maintaining and improving Massachusetts coastal protection.

This database will also provide relatively quick access to identify available documentation for these structures as well as the ability to be updated as coastal structure improvements are made.
Section IV - Mashpee

Part B

Structure Assessment Reports
**Structure Assessment Form**

**Property Owner:** Local

**Presumed Structure Owner:** Local

**Owner Name:** Mashpee

**Location:** Seconsett Island Road

**Date:** 8/8/2007

**Earliest Structure Record:** Unknown

**Estimated Reconstruction/Repair Cost:** $177,177.00

**Length:** 295 Feet NAVD 88

**Top Elevation:** 14 Feet NGVD

**FIRM Map Zone:** V18

**FIRM Map Elevation:**

**Primary Type:** Revetment

**Primary Material:** Stone

**Primary Height:** 5 to 10 Feet

**Secondary Type:**

**Secondary Material:**

**Secondary Height:**

**Structure Summary:**
This structure is a revetment along Seconsett Island Road. There is some slumping in the central section of structure resulting in a minor loss of crest elevation.

**Condition Rating**
- C
- Fair

**Level of Action Description**
Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure adequate to withstand major coastal storm with little to moderate damage. Actions taken to reinforce structure to provide full protection from major coastal storm and for extending life of structure. Moderate wind or wave damage to landform exists. Landform may not be sufficient to fully protect shoreline during a major coastal storm. Actions taken to provide addition material for full protection and extended life.

**Priority Rating Action Description**
- IV
- High Priority
- Consider for Next Project Construction Listing
- High Value Inshore Structures with Potential for Infrastructure Damage and/or Moderate Densely Residential Dwellings (1-10 dwellings impacted / 100 feet of shoreline)

**Structure Images:**
[043-119-000-011-100-PHO1A.jpg]

**Structure Documents:**

**Prepared By:** Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Mashpee

Location: Seconsett Island Road at Hamblin Pond
Based On Comment: 
Earliest Structure Record: Unknown
Estimated Reconstruction/Repair Cost: $64,020.00

Length: 485 Feet NAVD 88
Top Elevation: 14 Feet NGVD
FIRM Map Zone: V18
FIRM Map Elevation: 

Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: Under 5 Feet
Secondary Type: 
Secondary Material: 
Secondary Height: 

Structure Summary:
This structure is the jetties at the culvert into Hamblin Pond along Seconsett Island Road. The armor stone is weathered but solid. The side slopes and crest in good condition.

Condition Rating: Good
Level of Action Description: Structure observed to exhibit very minor problems, superficial in nature. Minor erosion to landform is present. Structure / landform adequate to provide protection from a major coastal storm with no damage. Actions taken to prevent / limit future deterioration and extend life of structure.

Priority Rating: Low Priority
Action Description: Inshore Structures Present with Limited potential for Significant Infrastructure Damage

Structure Images: 043-119-000-013-100-PHO1A.jpg
Structure Documents: 

Prepared By: Bourne Consulting Engineering
CZM Coastal Infrastructure Inventory and Assessment

Structure Assessment Form

Property Owner: Local
Presumed Structure Owner: Local
Owner Name: Mashpee

Location: Waquoit Bay entrance
Based On Comment:

Earliest Structure Record: 1945
Estimated Reconstruction/Repair Cost: $1,873,872.00

Length: 780 Feet
Top Elevation: Feet NAVD 88
FIRM Map Zone: V17
FIRM Map Elevation: 17 Feet NGVD
Primary Type: Groin/ Jetty
Primary Material: Stone
Primary Height: 5 to 10 Feet
Secondary Type:
Secondary Material:
Secondary Height:

Structure Summary:
This structure is the East Jetty at Waquoit Bay. There are multiple sections with damaged armor. These damaged areas show slumped sideslopes and loss of crest elevation. There is minimal interlocking between armor stones in the damaged sections.

Condition Rating Level of Action Description
D Poor Major Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure has strong risk of significant damage and possible failure during a major coastal storm. Structure should be monitored until repairs/reconstruction can be initiated. Actions taken to reconstruct structure to regain full capacity to resist a major coastal storm. Landform eroded, stability threatened. Landform not adequate to provide protection during major coastal storm. Actions taken to recreate landform to adequate limits for full protection from a major coastal storm.

Priority Rating Action Description
III Moderate Priority Consider for Active Project Improvement Listing Inshore Structures with potential for Infrastructure Damage and/or Limited Residential Dwellings (<1 dwelling impacted / 100 feet of shoreline)

Structure Images:
043-130-000-001-100-PH01A.jpg

Structure Documents:
MA-DCR January 194 Proposed Jetty 043-130-000-001-100-DCR1A
MA-DCR September 1 Proposed Shore 043-130-000-001-100-DCR1B
MA-DCR December 1 Reconstruction of 043-130-000-001-100-DCR1C
MA-DCR February 19 Plan of Land - South 043-130-000-001-100-DCR1D

Prepared By: Bourne Consulting Engineering
Section IV - Mashpee

Part C

Structure Photographs
<table>
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<td>DIGITAL IMAGE</td>
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Section IV - Mashpee

Part D

Structure Documents

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MA DEP – Ch 91 DOCUMENT LIST
  • Copies of License Documents

USACE – PERMIT DOCUMENT LIST
  • Copies of Permit Documents
No Town Documents for the Town of Mashpee

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<th>Document No</th>
<th>Contract Drawing Number</th>
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NO ACOE PERMITS FOR THE TOWN OF MASHPEE